THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1378.] LONDON, OCTOBER 8, 1889. [41ST YEAR. Price 6d.

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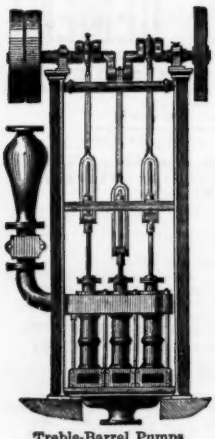

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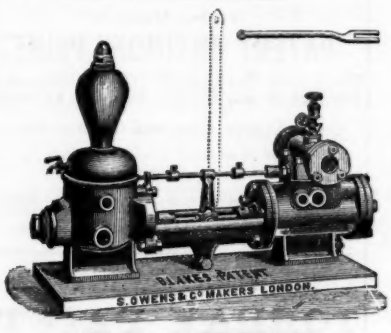

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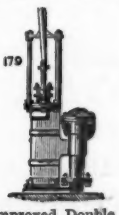

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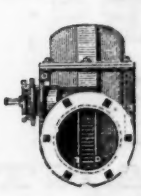

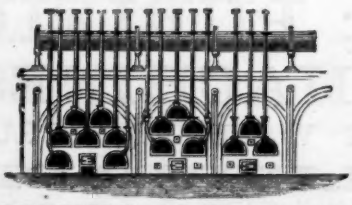

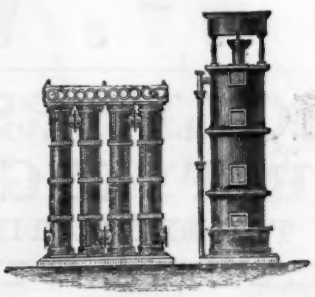

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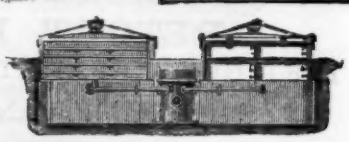

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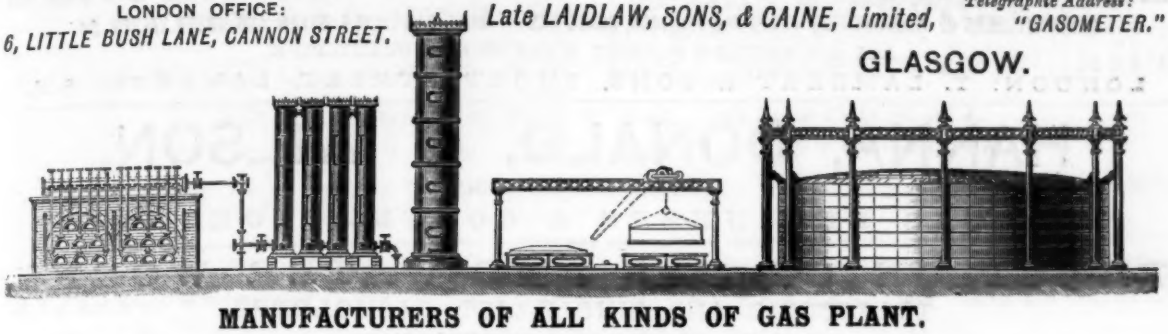

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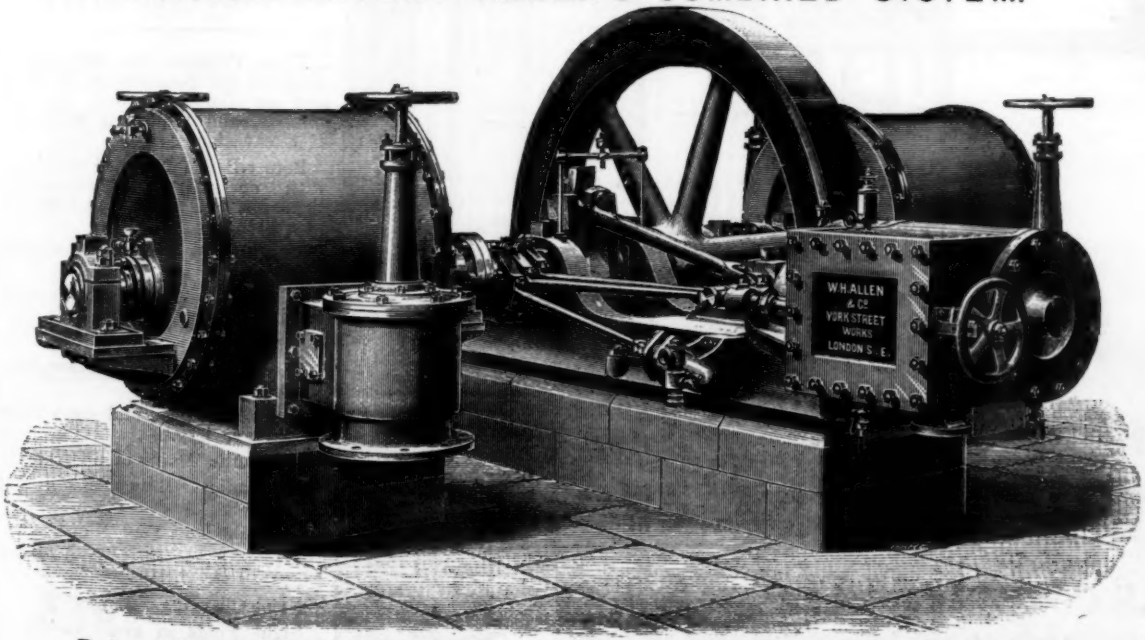

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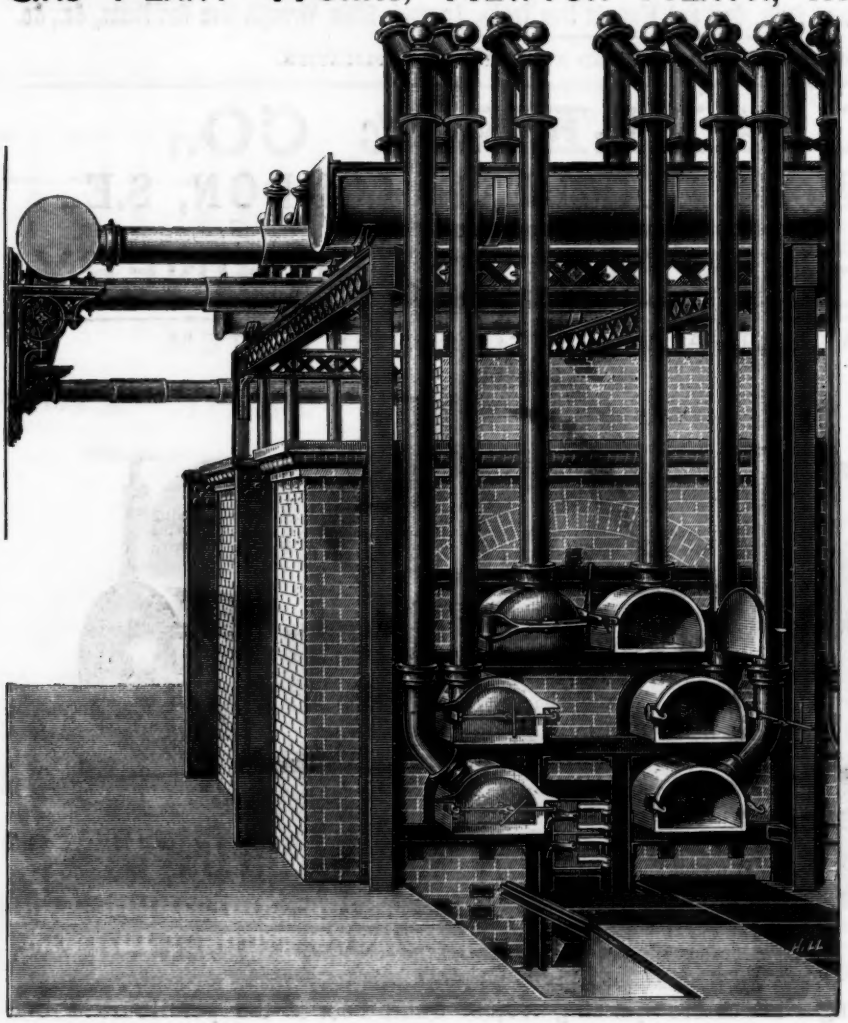

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Regenerative Furnace
TO A
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These Furnaces are very economical in the consumption of Fuel and in the wear and tear of Retorts, and require a minimum of Excavation.

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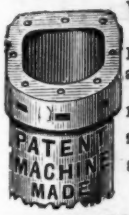

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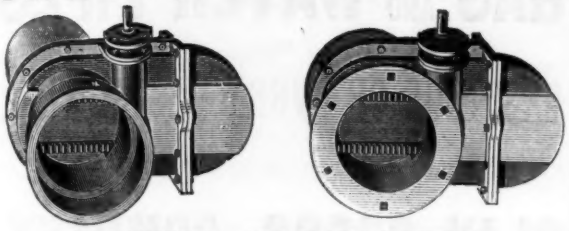

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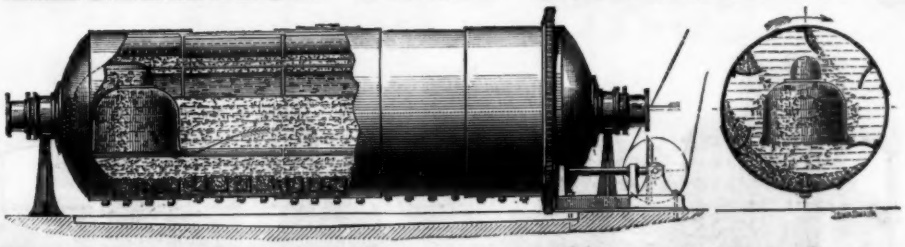

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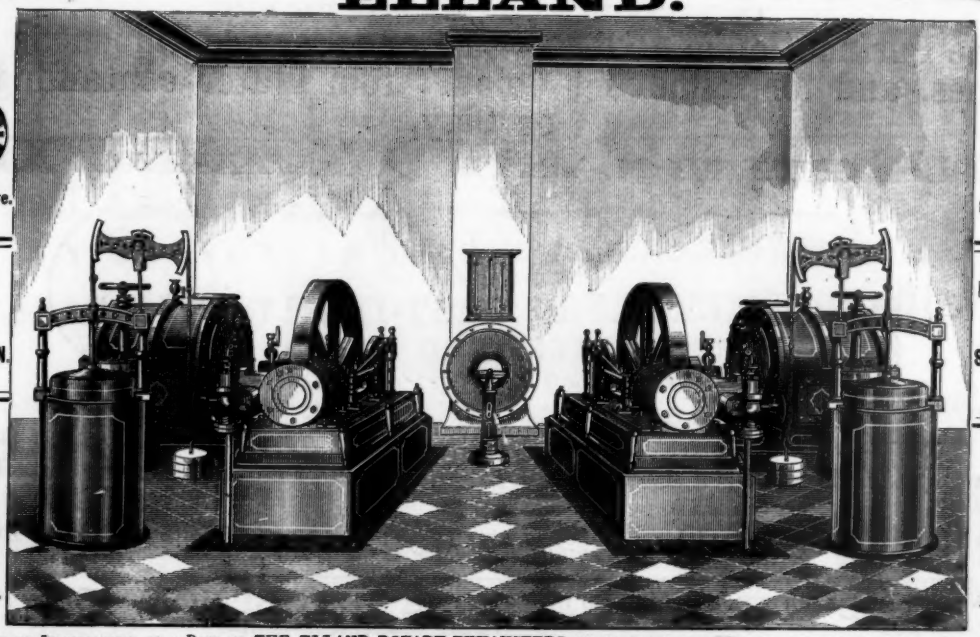

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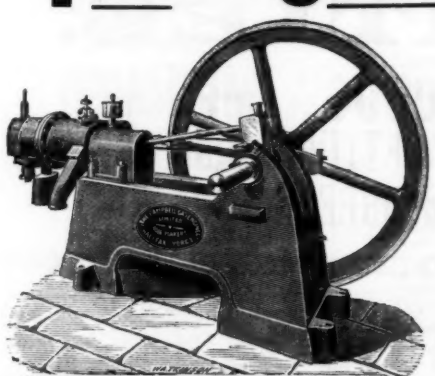

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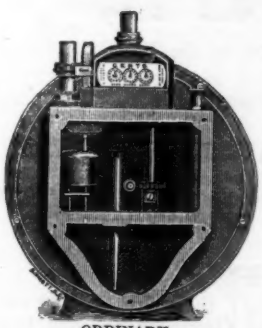

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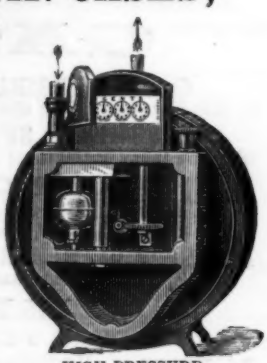

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5	9½	16¾	13
10	10¾	19	15
20	13½	24½	18½
30	16⅛	27½	21¼
50	20¼	33½	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63½	49½
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3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅜	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
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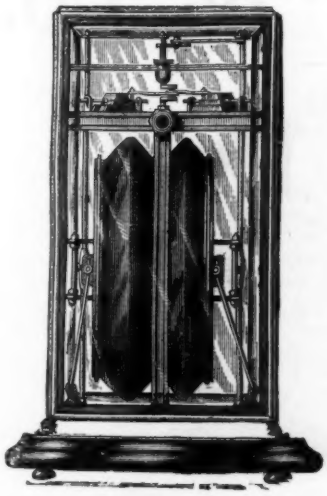

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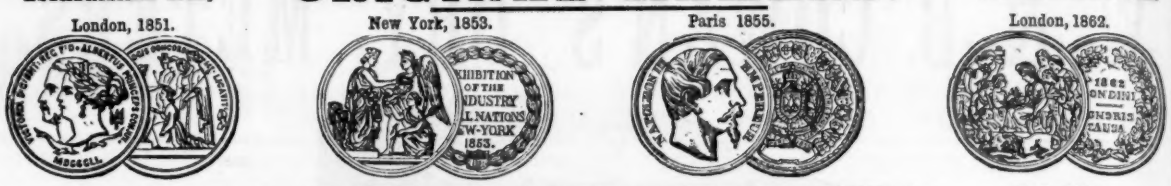

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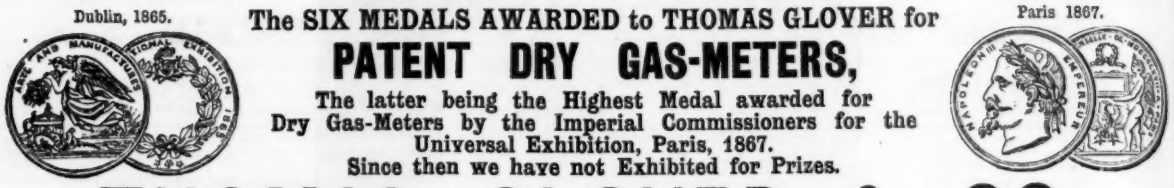

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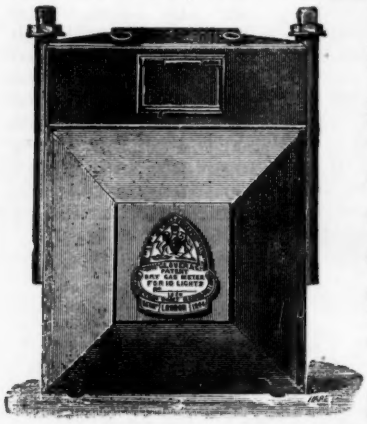

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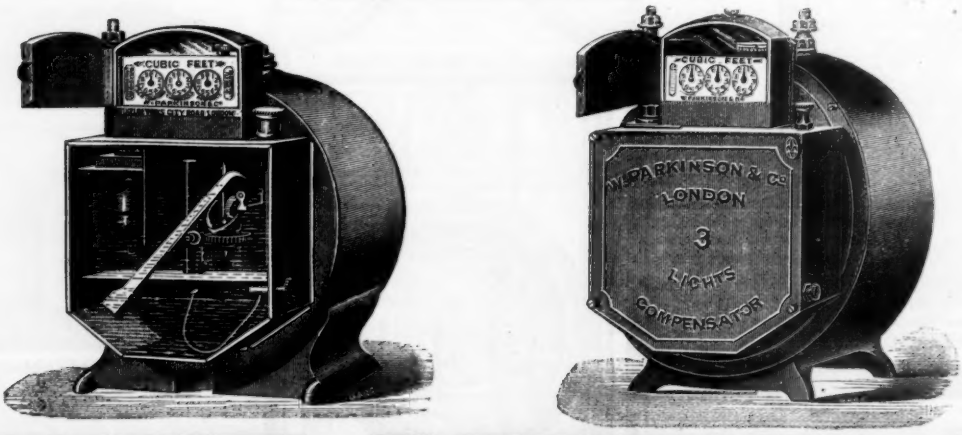

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[See also Advt., p. 728

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 8, 1889.

THE LABOUR QUESTION.

THE only item of interest in connection with the labour question that has come prominently into notice during the past week is the dispute at Bristol, where the retort-house men in the employ of the Gas Company have declared their intention to leave work to-morrow unless they are granted an increase of pay amounting to 8½d. per day for the stokers, and 7½d. per day for the wheelers. The Directors had agreed to advance the wages of the yardmen 2s. a week, to grant the men a week's holiday in the year, and to give and receive 10 days' notice; but they decline to accede to the demand for the higher rate of wages for the stokers, which is far above the standard of the district. The Directors say they are willing to give the stokers 35s. per week of seven days of eight hours, and to increase the wages of the wheelers from 23s. 9d. to 28s.; but they will resist to the uttermost the attempt to force up the stokers' wages to 37s., as being wholly uncalled for. They say they can replace the whole of their men, if they should go out, at the old rates of pay; and they are believed to be preparing to stand a siege. The men, on the other hand, have just become affiliated to the Gas Workers' Union, and will, it is said, have the support of this organization. This rumour is not yet confirmed; but if it is well founded, it indicates that the Society have decided to try their strength in this preliminary skirmish in the provinces before venturing on a campaign elsewhere. We believe, however, that if the Union pins its existence to the success of the Bristol strikers, a great mistake will be made. Bristol will serve as well as anywhere else to try the question of whether 35s. a week is or is not a reasonable rate of pay for gas stoking; and if the Directors of the Gas Company determine to fight on the point, the men will have quite as much as they can well do to stand their ground. The maintenance of the Bristol strikers will be the first real responsibility the Gas Workers' Union has had to face; and if its managers accept battle on a weak ground, they will wreck the organization. As we have already stated in previous articles dealing with this subject, we sympathize with the men when they use their combined energy to secure for all, those advantages—such as holidays and Sundays off—which many of them actually enjoy. The question of the sufficiency of a given rate of wage, however, is not so much a matter of principle as of observance of a recognized standard of value for labour in the locality concerned. Gas workers ought to be well paid; and, as a general rule, they are remunerated better than most workmen in other employments. For this reason gas managers have the pick of the labour market; and their difficulty is not in the getting of men, but in selecting the best from those at their command. The rate of wages to be paid in any place, however, is not a matter to be settled by the manager or the men alone, but must form the subject of a mutual agreement between both parties, with an implied reference to the value of labour in other industries. It is as arbitrary an act for men to declare that they will not work any more unless their wages are increased beyond the average, as it would be for a manager to declare his intention of paying less money than the men had been in the habit of receiving. One can understand that if the men at any gas-works were paid less than their fellows in the neighbourhood, they would have reason to complain and demand better treatment; but where the Bristol men are going for better pay, if they leave their present employment, it is difficult to imagine. We are not devoid of hope that wiser counsels may prevail, and that the Bristol men will withdraw their notices before matters proceed to the last extremity.

At Leeds the men appear to be asking for terms very similar to those which the Bristol men contemplate throwing away; and this does not look as though the interchange of information and counsel among the branches of the Union is particularly perfect. In Birmingham, negotiations have been in progress between the Gas Committee and the men; and it is believed that a settlement favourable to peace will be arrived at. There is undoubtedly a general process of "level-"ling-up" going on throughout the country, which will in some places quicken the intelligences of committees and boards of directors with regard to their backwardness in the matters of plant and system. If people of this character get "left in a "hole" through the exodus of their retort-house hands to better places, nobody will sympathize with them. We know, up and down the country, many instances of the representations and even remonstrances of managers being systematically ignored by self-sufficient committeemen and directors, who oppose the provision on the score of expense of more plant than barely suffices for hand-to-mouth working. A pleasant prospect opens before these gentlemen with the advance of winter. There may be just enough retorts, or just enough storeage room to carry on with, if matters go on comfortably in the works, and the afternoon gang are contented to wait about with the lids slacked off until the putting on of the night pressure calls upon every retort to be charged in order to keep the holders off the ground. Suppose, however, the old gangs are broken up, and "scratch" ones have to be put in their places. Then the

possession of a few extra retorts to help the less regular and efficient working of the new hands may make all the difference between keeping up the supply and plunging the town in darkness. The men who should be convicted of rendering the latter disaster possible would not be excused by the community on the score of the subsidy which they handed over the previous year to the rates.

Whatever lessons these labour troubles teach gas administrators, they prove the necessity of keeping the plant well up to the mark, so that there would be time to turn round in the event of a sweeping change of working staff. At the same time the worry and loss attending such an eventuality will naturally lead directors and managers to consent to any reasonable request for better treatment on the part of their men. If, after all, the worst comes to pass, and the men spurn reason, and seek to impose terms which the common sense of the community condemns as impossible, then the employers will have a good case to lay before the public, and will be able to ask for consideration and forbearance while they fight out the issue of who is to manage the business supposed to be committed to their direction. A gas-works strike or lock-out is a serious matter, not to be lightly entered upon or even talked about. So far as we can speak for the employers, we are confident of being borne out in stating that nothing is further from their desire than to quarrel with their workmen, or to give the men cause to quarrel with them. Labour disputes are abhorrent to them, for they know that their undertakings must be carried on at all costs, and are not like cotton mills or coal mines, which can be shut down or run short time purely out of commercial considerations. When the factory-owner has nothing particular in hand, he can make his workpeople suffer as well as himself; and when he has an urgent contract to complete, the hands feel that their opportunity has then come. All this is so different from the condition of things in gas supply, that the importation into it of methods of industrial warfare which are practised amid other circumstances seems to be in the highest degree irrational and superfluous. The Gas Companies admit their general prosperity, and are willing to share it with all who can claim to participate. They do not proclaim, like the coal-owners last spring, that they never, never will or can pay another 10 per cent. on their wages sheets, and end by doing it within a week. We look, on the contrary, to them to be as good as their word, and, if they take up a policy, to stick to it. There must be no hesitation about it, or the Companies will lose both money and credit. Having decided the rate of wages they mean to pay, which will compare favourably with that which their men could expect to earn in any other employment, they must be prepared to fight the matter out, on the line so marked, at all hazards; for, whatever may be the cost of victory, they cannot afford a defeat.

THE COMMERCIAL GAS COMPANY'S MEETING.

The general meeting of the Commercial Gas Company was held on Friday, and the report, which will be found in full in another column, contains several interesting points. It is unnecessary to say anything more about the prosperity of the Company, which is acknowledged on all hands. It is worthy of remark, however, that the Directors appear to be sincerely desirous of deserving this prosperity, so far as they are able to act in this direction, by just treatment of the consumers, and care of the interest of the officers and men in their service. Two noteworthy references to the respective merits of gas and electric lighting were made in the speeches of Sir Robert Rawlinson and Mr. George Livesey respectively. Speaking of the practical difficulty of managing the intense light of the electric arc, so as to be useful for ordinary purposes, Sir Robert stated that at the Forth Bridge, which has been advanced by night work, the electric lighting provided for this purpose worked out to an allowance of 700 candles per man employed on the works. This is a truly startling figure. Of course, a man does not want 700 candles, or anything like this share of light, to enable him to work, or find his way about scaffolding. This represents so much waste of lighting energy; and the lesson of this statement may be commended to the wiseacres who make out that electric arc lamps for street lighting, for example, are cheaper than gas, because, although costing more money, they yield so much more nominal intensity of light. So much the worse, it may be replied; for who wants hundreds of candles to light him across a road? Mr. Livesey's remark had reference to the brilliant lighting of the sea-front at Brighton by the local Gas Company, which he described as the "finest bit of gas lighting in the world"—utterly eclipsing the efforts of the electricians in the neighbouring town of Eastbourne. Gas engineers, directors, and corporation committeemen in want of an excuse for running down to Brighton during the coming winter season will do well to make a note of this remark of Mr. Livesey's, for it is not always that street gas lighting can be studied under such eminently satisfactory conditions as those attending a prandial stroll along the King's Road. Mr. H. E. Jones made a capital speech on fuel gas and the extension of gas consumption; and altogether the meeting was one of the pleasantest the Company have held for a long time. Mr. Ratcliff, the present Chairman, occupies the chair very satisfactorily. He does not pretend to talk at length about details, with the idea of persuading his hearers that he possesses great technical knowledge; but there is something sterling in his manner that admirably suits a meeting of shareholders. Mr. Gill also distinguished himself at the meeting by doing what Deputy-Chairmen rarely find an opportunity to do—making a good speech, straightforward and sympathetic, about the officers of the Company, who have had to deal with the recent labour troubles. He carried the assembled proprietors with him in his kindly remarks, which were conceived and uttered in the best possible spirit.

NORTH OF ENGLAND GAS MANAGERS AT DONCASTER.

The members of the North of England Gas Managers' Association met at Doncaster last Friday, under the presidency of Mr. Robert Bridge, the Gas Engineer to the Corporation, who extended a cordial welcome to his visitors. The meeting was not very largely attended—a circumstance due to the geographical position of the town on the extreme southern limit of the district occupied by the Association, and one which supplies a reason to be quoted against the too wide extension of societies of the kind. The presidential address will be found in another column, and is well worth reading; being clearly argued, and written in an interesting style. Mr. Bridge is a bold man. The officer of a local authority himself, he did not shrink from alleging that members of some corporations apply gas profits in relief of rates, "not always "because they believe the principle is right, but in order to "secure for themselves popular favour at municipal elections." He ascribed this propensity to the spirit of the age, which demands that quick returns should be shown on all investments. We believe, however, that one age is very much like another in this respect. Mr. Bridge reviewed the positions occupied by electricity, water gas, and illuminating oils, and admitted the severity of the competition of the latter with gas; stating that he had ascertained the consumption of mineral oils in Doncaster to be upwards of 1000 tons yearly. This is certainly a startling figure; and it would appear probable that a large proportion of this supply finds its way out of the town again by various outlets. Mr. Bridge gave some particulars of the working of a sewer-ventilating lamp-column of his own devising; and, with a few discursive remarks on a variety of gas engineering topics, the address came to an end within a reasonable space. A paper was read by Mr. J. H. Cox, jun., of Sunderland, on "Gas Popularization," which also appears elsewhere; and in the course of the day the members visited the Great Northern Railway Company's works, which make Doncaster in one respect so like Crewe and Swindon.

SETTLEMENT OF THE DUBLIN GAS DISPUTE.

The great arbitration that was to settle the long-standing quarrel between the Corporation of Dublin and the Alliance and Dublin Consumers' Gas Company was opened on Monday last week in due form. At eleven o'clock the Arbitrators—Mr. J. Shiress-Will, Q.C., M.P. (Umpire), Mr. A. G. Vernon Harcourt, F.R.S., and Mr. H. E. Jones, M. Inst. C.E.—took their seats in the Solicitors' Hall of the Four Courts; and seven "Counsel learned in the law," and upwards of a dozen-and-a-half of expert witnesses, attended the opening of the proceedings, to say nothing of aldermen, town councillors, gas directors, and others more or less interested in the business in hand, who were there to "see fair." We have said the Arbitrators sat down at eleven o'clock; and for more than two mortal hours they continued to sit with nothing to do, while on all sides was a scurry of lawyers and principals evidently engaged in trying to "square" each other, and so prevent the dirty linen, of which both sides had, figuratively speaking, provided vast piles, from being publicly washed. With lunch time the trial of patience of the Arbitrators came to an end. They were told that nothing would be done that day; and so they departed with all the dignity they could muster under the circumstances. Next day the scene was

enacted again, with the variation that after some delay Counsel filed into Court, and it was declared that the arbitration must go on. Before the long-suffering Arbitrators could settle to their work, however, there was another interruption, after which they were informed that their services would not be required, as all differences had been settled out of court! Never was a more complete *fiasco* heard of, even in connection with the Dublin Gas Supply. We are nowise surprised at it, for it is impossible to trust implicitly in the good faith of either party to the dispute which, after so much fuss, has come to such a "lame and impotent conclusion." What breathings of fire and sword, so to speak, have been heard in the City Council Chamber against the brigands of D'Olier Street; and how proudly the Company nailed their colours to the mast and vowed never to draw back from the course of defiance on which they had entered, until the nefarious conspiracy against them had been turned inside out! How it all reminds one of the boastful "Ho! let me "at him!" followed, as Mark Twain says, by the prudent "Two of you hold him; one can hold me!" We are conscious that these remarks are flippant, not to say disrespectful, to both of the high contending parties who have thus patched up their undying feud without fighting; but who can help smiling over the affair when he reads the story? The whole thing is too ludicrous for comment. Personal squabbling, rivalry, and bad blood have been the origin and sustenance of the disagreement, which would not have endured for a day after a few irreconcileable people on both sides had been sent "to the right-about," and the direction of affairs confided to reasonable men. Instead of this, irreconcileables have been pitted against each other; and the mutual concerns of the Corporation and the Company have been managed in the method of fretful children. And now we want to know what excuse the Corporation and the Gas Directors, or whoever is responsible for the ridiculous display, can offer to the people who will have to pay for it.

AN AMERICAN CRITICISM OF THE "JOURNAL."

One of our American contemporaries, *Progressive Age*, animadverts in a recent issue upon some passages of the descriptive article in the Journal for Aug. 6, relative to the Loomis process, which it affects to consider inconsistent with the strictures we passed on July 9 upon some of the claims advanced by American patrons of this system of gas making. It also objects to our remark that Mr. Loomis appears to have been left out in the cold both by the American water-gas and coal-gas interests, and charges us with writing of these subjects with the "usual ignorance of American affairs "and work," and with not knowing that a soft-coal water-gas process is a *desideratum*. We can make some allowance for the natural feeling of irritation which an American Editor may be supposed to entertain at seeing the first precise information regarding an admittedly interesting gas manufacturing process of American origin in our pages instead of in his own. But this is not our fault; and the welcome we have given to Mr. Loomis's plans, and are willing to extend to those of any of his equally deserving rivals, should acquit us of the charge of wilfully ignoring American "affairs and "work." As a matter of fact, we keep an observant eye upon American doings, and publish a good deal of technical matter of trans-Atlantic origin. We have many friends on the other side, and enjoy the "advantage" of regularly seeing three American journals devoted to gas affairs. If with all this—and especially the latter—we are yet ignorant of American gas concerns, the blame should be divided between us and our sources of information. With regard to the Loomis process, it is impossible to convict us of failure to realize the importance of the object which this system is claimed to effect. On the other hand, we have not advanced a single statement capable of conveying the impression that we vouch for the success of this particular plant. It will be time enough for an expression of opinion on the merits of the process when we have seen it at work in England. No doubt the Loomis system has been prejudiced by the wild claims made for it by rash partizans; but it is not the only American project of which the same can be said. If we have offended the Editor of *Progressive Age* by mentioning the Standard Oil Company in connection with the water-gas business of the States, we are sorry for it; but we certainly had an impression that the connection existed, and found its expression in some of those "strikes" and "deals" by which coal-gas companies have been converted into mixed or water-gas concerns. Lastly, we are accused of sudden forgetfulness, presumably for Mr. Loomis's benefit, of the fact that all water gas, even if made from soft coal, contains a considerable proportion of carbonic oxide; whereas heretofore the presence of more than 10 per cent. of carbonic oxide has seemed enough, it is remarked, to damn any gas in our eyes. But we have nowhere stated or implied that the Loomis or any other water-gas process is fit to supplant coal gas in England. Indeed, in the very article which has so roused the ire of our American critic, it is explicitly remarked that Mr. Loomis himself does not expect that British Gas Companies will be at liberty to adopt his system, which is introduced only for factory owners. We have taken the trouble to reply to *Progressive Age*, which once advertised itself as the water-gas journal of America, simply in order to correct misrepresentation. It might form an interesting problem for a metaphysician to inquire why misrepresentation, by whomsoever started, has such wonderful travelling energy as compared with simple truth. Of course, we know that truth has superior staying power; but give a misrepresentation, whether wilful or merely due to carelessness or stupidity, a short start, and it is an exceedingly difficult task to overtake it.

THE SANITARY INSTITUTE SCANDAL.

On the occasion of the recent meeting of the Sanitary Institute at Worcester, the Worcester Gas Company were induced to co-operate with the Council of the Institute in rendering the usual accompanying exhibition attractive. With this view, the Company offered prizes for gas-stoves, which are supposed to be under the special patronage of the Institute. It is unnecessary to state what were the points of excellence for which these awards were to be bestowed, or the names of the competing makers. Suffice it to say that the Institute do not intend to test the exhibits and make the awards while the exhibition remains open. But after their Congress is over, and people, even in Worcester, are rapidly forgetting all about it, they propose that the tests should be made in London—of course, for a special entrance fee; and the awards would perhaps follow at some period when all interest in the matter had died out. This proceeding is giving great dissatisfaction; and it would not be surprising if the Worcester Gas Company were in consequence to withdraw their countenance from the Institute. In truth, this is not the first time they have followed the same tactics. If they are not a very distinguished organization, they might at least be honest; but that is what they certainly are not in regard to their quite superfluous patronage of gas apparatus. We believe the makers of other sanitary and domestic appliances, such as ventilators and cowls, have as much cause to complain of the management of the Institute "tests" as gas engineers; but we are now only concerned to speak for the latter. The Institute people are sharp enough in offering inducements to exhibitors, and in securing the support of the Gas Companies of the towns which they visit; but they take everything they can, and render nothing for it. The recent experience of the Worcester exhibitors and the Worcester Gas Company is a repetition of Leicester, Exeter, and other places. As it seems impossible for criticism to reach the managers of the Institute, which only starts into life once a year at its country congresses, we strongly advise Gas Companies and Corporations not to have anything to do with its "tests" of gas-stoves, and they will thus escape the blame of assisting to deceive and disappoint competitors at its exhibitions.

At a meeting of Fire-Brick Manufacturers held at Stourbridge on the 24th ult., it was unanimously agreed, consequent on the increase in the price of coal and cost of manufacture, to advance (as from the 1st inst.) the price of fire-bricks 5s. per 1000, cement clay 1r. per ton, and all other goods 10 per cent.

The Wenham Company, Limited, have been awarded a gold medal (highest award) in the French Section of the Paris Exhibition for their exhibit of Wenham lamps. They have also received a bronze medal for ventilation. A silver medal—the highest award—has been obtained by the Lothammer Gas Manufacturing Company, Limited.

We have to acknowledge the receipt of the first volume of Grove and Thorpe's "Chemical Technology," which has recently been published by Messrs. J. and A. Churchill, of New Burlington Street; and "Service Chemistry," by Mr. Vivian B. Lewes, F.I.C., F.C.S., Professor of Chemistry at the Royal Naval School, Greenwich, published by Messrs. W. B. Whittingham and Co., of Gracechurch Street. The former work deals with fuel and its various applications; the authors being Mr. E. J. Mills, F.R.S., and Mr. F. J. Rowan, C.E., with the assistance of Mr. C. E. Groves as Editor. Mr. Lewes's book is a short manual of chemistry and its applications in the naval and military services. Reviews of both works will appear in early issues of the Journal.

Water and Sanitary Affairs.

At the half-yearly meeting of the East London Water-Works Company last week, the greater part of the speech delivered by the Chairman—Mr. A. W. Gadesden—had reference to the works now in hand under the superintendence of the Company's Engineer, Mr. W. B. Bryan. The operations connected with the approaching removal of the principal pumping-station from Old Ford to Lea Bridge are not a little remarkable. A 42-inch main is to connect the new pumping-station at Lea Bridge with the Company's distributing system at Old Ford; and this is nearly complete. In its course it passes twice under the River Lea, and twice over it. The engine-house will contain three engines, capable of pumping something like 45 million gallons of water into the district in 24 hours. This splendid plant may be pronounced worthy of the Company which gives the largest supply of any in the Metropolis. Last August the volume of water distributed by the East London Company was nearly one-fourth of the entire Metropolitan supply. But perhaps the most interesting part of the question has reference to the source from which the ever-growing demand is to be met. In the course of seven years, the average daily supply given by this Company has increased by more than 4¼ million gallons; and General Scott, in his annual report for 1887, expressed considerable anxiety as to the capability of the Company to meet the demand that would arise in future dry seasons. He referred to the three wells then in course of construction—namely, at Lea Bridge, Walthamstow, and Waltham Abbey; but suggested that too sanguine a view might easily be taken of the capabilities of the chalk in the Lea basin for supplementing the volume of water then derivable from the river. The wells, he feared, would to some extent intercept the river springs, though he allowed that there would be a balance in favour of the enterprise, as some springs would be caught which would lie too low to enter the river. General Scott, while doubtful as to the future, approved of the undertaking, saying: "The "project in question, which includes tunnelling, in addition "to well-sinking and boring, is one which must be highly "commended." It was calculated to give more water, and better; the only doubt being as to how much more could be reckoned upon. The Chairman, at the recent meeting, stated that the well at Waltham Abbey yielded an abundant supply of water; and the engines worked in a most satisfactory manner. The well at Lea Bridge had been carried down more than 400 feet into the chalk; and in that respect was complete. But tunnelling was now in progress, so as to feed the well. Up to the present moment a large quantity of water had not been secured; but the Engineer saw no reason to doubt that eventually they would get all they wanted. We presume Mr. Tendron had this well in view, when he made the remark that another lesson was now given to the public, in addition to many which had preceded it, showing the mistake of supposing that, if a well was sunk in the chalk, there was a certainty of finding water. Probably tunnelling will bring the expected supply. At Walthamstow, there has been considerable difficulty in getting a start, owing to the interposition of a stratum of shifting sand. The cylinders have been sunk through this bed, and are now 7 feet in the chalk, so that further progress will be easy. At this spot, Mr. Bryan has no doubt as to finding water. The operations, altogether, are very interesting, as well as important; and the results will throw further light on the question of the water supply in the Lea Valley, including the relation of the wells to the river.

Mr. Lass's Analysis of the London Water Companies' Accounts.—By an advertisement which appears elsewhere, our readers will learn that the analysis of the accounts of the Metropolitan Water Companies for the year ended Dec. 31, 1888, and March, 31, 1889, by Mr. Alfred Lass, F.C.A., was issued yesterday. This is the ninth year of publication of this useful work, a notice of which will be given in the next number of the Journal.

Reduction in the Price of Gas at Tokio (Japan).—We learn from Mr. W. Newbigging, the Engineer and Manager of the Tokio Gas Company, that they have reduced the price of gas to the extent of 75 sen (2s. 3¾d.) per 1000 cubic feet. The price as from the 1st ult. will be 2 yen (3s. 2d.), with a discount of 5 per cent. to all consumers of gas to the value of 100 yen per month. The original price of gas was 3 yen per 1000 feet. We must congratulate Mr. Newbigging on the successful working of the undertaking; the figure to which the Company have now reduced their price being, we believe, as low as that of any gas company in the East.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 715.)

The ruling influence in the Stock Markets last week was the demand for money. There was even some fear that the Bank of England might have to raise its rate still higher. This had a depressing effect; and some relief was experienced when Thursday passed over without a change. Subsequent business, however, was restricted in view of the Stock Exchange being closed on Saturday for repairs. The raid on Gas securities has entered the second stage. While some issues (which, as we noted last week, had not then been touched) were arbitrarily put down in quotation to a more or less considerable degree, there was a distinct rally in Gaslight "A." It opened weak on Monday morning, and was quoted during the day nominally about 240-244; business being marked more than once at 242, the lowest point reached. A turn, however, set in at once. After the close of official prices, the quotation was 248-253; and on Tuesday morning the first mark was 252. Throughout the rest of the week there was a long string of transactions marked between 250 and 252; one solitary 249½ being the only one below. The other Gaslight issues have meanwhile remained practically unaffected; a few dealings in the 10 per cents. and one in the 7 per cents. being done at the old figures. The tampering, so to speak, with South Metropolitans has been irregular. The "A" has been opened out to 310-320, which is really a shade better; but "B" and "C" have been put down 8 to 10. The former had been business marked twice at 230; and the latter was done "specially" on Wednesday at 240. Commercial old was put down 2 on Tuesday; but no business was done in it all the week, and probably the move was only a "feeler." At the Company's general meeting on Friday, it was pleasant to hear speaker after speaker among the body of proprietors aid in exposing the true character of the attack made upon gas stocks, and emphasize the advice we gave last week to proprietors to stick to their property, and not to be frightened out of it. Suburbans and Provincials offer nothing to remark; but some of the Foreign division are down—some in sympathy with the general decline in prices owing to the dearness of money, and some for special causes. Thus, Imperial Continental has receded 3½; Bahia, 1; and Buenos Ayres, ½. The state of the currency in the latter quarter is very perturbing. In Water, there is next to nothing to say. A special bargain in Lambeth on Monday slightly depressed it; but all else has been quiet and steady.

The daily operations were: Monday's Gas business was nearly all in Gaslight "A," with the result mentioned above; but South Metropolitan "B" fell 2. Lambeth Water fell 1. On Tuesday, Gaslight "A" rose 5½; but Imperial Continental was flat and fell 1, and Commercial old lost 2. On Wednesday, Imperial Continental fell back another 1½, and closed weak at about 207½. Buenos Ayres was ½ worse. South Metropolitan quotations were made quite nominal—equivalent to a relapse of 5 each in "B" and "C." Gaslight "A" remained steady on Thursday; and there was no change anywhere except a drop of 1 in Bahia. Prices remained about the same on Friday generally; but Imperial Continental was 1 weaker at 207, and South Metropolitan "B" was the same at 230.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting in the "Pall Mall Gazette"—Mr. W. H. Preece explains—The Leeds Corporation and the Electric Light.

The task of writing-up the various electric lighting speculations of London has been taken in hand by the *Pall Mall Gazette;* the *Daily News* series of articles on the same subject being concluded. One day last week the *Pall Mall* came out with a report of a long interview of their representative with Mr. J. E. H. Gordon, the Managing Director and Electrician-Engineer of the Metropolitan Company. The first paragraph of the story is headed "Mr. Gordon's Record;" and we naturally read it curiously to see if it gave the hidden history of Mr. Gordon's experience in the matter of the Paddington experiment, which led to the termination of his connection with the Telegraph Construction Company. It says nothing about these things, however; the "record" being conveniently restricted to the statement that the subject of it planned the Paddington installation five years ago, and two years since was appointed Engineer to the Whitehall Court Electric Lighting Syndicate. With regard to matters of current interest in relation to the circumstances of the Metropolitan Company, which is the creation of the Whitehall Syndicate, we are informed that the Company have five stations, three of which are almost complete. The names of these stations and their situations are—Whitehall Court, Sardinia Street (Lincoln's Inn Fields), Rathbone Place, Manchester Street, and Waterloo Bridge. They are intended to serve a district in which the Company are under statutory obligations to lay 35 miles of street main within 18 months. Whitehall Court is the old station, and the only one actually working. Sardinia Street is being fitted up by the Westinghouse Company; and the Manchester Street and Rathbone Place ones are in the hands of the Electric Construction Corporation, of London and Wolverhampton. It is admitted that the American plant will cost considerably more than the English; but the Company have plenty of money—at least to begin with—and so they are desirous of seeing the best the American electricians can do. Mr. Gordon told his interviewer that his Company charge 8d. per unit for their energy, "which comes to a farthing per lamp per

hour, as compared with a fifth of a penny for gas." Here we have another estimate of the comparative cost of electric lighting and gas, which does not agree with some of those we have recently published. It comes very the *Daily News* estimate, however, if by the term "lamp" we understand a nominal 10-candle lamp in both cases. A 10-candle gas-burner consumes presumably 3 cubic feet—or (say) 3·3 cubic feet—per hour; consequently 300 of them can be had for 2s. 6d. in the Metropolitan Electric Company's district. This, according to our arithmetic, comes to a tenth of a penny per burner, instead of a fifth as stated by Mr. Gordon. Arithmetical comparisons are despised by electricians however, for he says roundly that he and his colleagues "consider that electricity is as cheap as gas." The main point is to discover what the public will "consider" respecting this comparison, when they have the opportunity of trying the experiment.

Mr. W. H. Preece has had to write to *The Times* in explanation of what he is reported to have said before the British Association at Newcastle respecting the deadly nature of electrical currents of high tension. He then appeared, on the authority of a Board of Trade inspector, to ridicule the idea of electricity causing the death of a man in a Brighton brewery, which happened to be the subject of a pending lawsuit between the dead man's widow and the local electric lighting company. Called to account for his remarks by the medical man in charge of the case, Mr. Preece now admits that it was a mistake—whose mistake he does not say—to couple the name of a Board of Trade Inspector with his Newcastle assertions; and confesses that the information on which he spoke was supplied by "the local Manager of the Electric Light Company." There is no attempt to justify the original statement; and it is evident that the irrepressible Post Office Electrician would not have secured the "laughter and cheers" of his Newcastle audience if he had told them he was speaking on the side of the Company that killed the man, and from information supplied by their own officer. Mr. Preece thus lays himself open to a very nasty rejoinder from his Brighton antagonist, who has not failed to take advantage of his opportunity. The fact of the matter is Mr. Preece talks a great deal too loosely about electric lighting for the preservation of respect for what he says.

The proposal of the Leeds municipal authorities to extend their electric lighting responsibilities, at an immediate capital cost of £25,000, with an engagement to increase the outlay to £68,000, has been mentioned in this column in connection with some criticisms passed on the scheme by the *Electrical Review*. Our contemporary ridiculed the Leeds Corporation for what they have done so far in the matter of electric lighting; asserting that a large proportion of the £10,000 which their experiment has cost the ratepayers has been muddled away. Notwithstanding this, it advocated the acceptance by the Town Council of the extended scheme prepared by the same men. The matter has come before the Council and has been debated at great length, with the result that it has been shelved for six months. This means a delay of another year in getting a Provisional Order under the Electric Lighting Act, if the Corporation eventually make up their minds to apply for one. They are, of course, abused in the local press for their hesitation in this business; but the fact appears to be that the members of the Electric Lighting Committee of the Town Council do not feel at all confident of their own ability to grapple with a large installation. The little affair on which they have spent their £10,000 has been almost too much for them; and beyond this they do not yet "feel their feet." There is something in the suggestion that if the next step in advance is delayed for a year, Leeds will have the advantage of profiting by what the great London Companies will find out in the meantime about the distribution of large quantities of electricity. But it is more of an excuse than a reason for delay, because the circumstances of these concerns do not at all resemble those of the Leeds Corporation. The fact is that the Leeds Corporation, like some other local bodies similarly situated, are halting between two opinions. On the one hand, they would like to keep out speculative companies; and, on the other, they are afraid to move in the business themselves. The threat of a private company stepping in to lay electric wires through their streets, and take any profit that may attach to the lighting business, throws them into a hot fit, immediately followed by a cold one when they reflect on the large sum of money they must venture if they go in for the speculation themselves, and the ease with which a great deal of it may be lost. The only logical way for corporations so afraid to incur responsibility, yet so desirous of attracting electric lighting into their town, is to make terms with a respectable local company to do the work under their patronage.

However valuable may be the labours of the Massachusetts Board of Gas Commissioners, whose last annual statistical report has recently been noticed in our columns, those of their colleagues, the State Police Board, do not always bring credit to them. According to the *American Gaslight Journal*, the duties of this body "seem to be in the nature of an irresponsible Smelling Committee, while their actions are often of the kind allied to buncombe. Having taken it into their heads that the health of workmen who were obliged in certain factories to use irons heated by gas was being injured, the 'police' instituted an investigation. So far, however, the investigators have met with small comfort; for many of the workmen declare that their labour has been rendered much more pleasant since the introduction of gaseous fuel into workshops of the class where many irons are used."

A NEW SYSTEM OF GASHOLDER GUIDING.

In the course of the many articles that have appeared in the Journal in connection with the discussion of the principles of gasholder stability, we have permitted it to be known that the last word had not been said on the subject of the possibility of guiding gasholders from the base. The time has now come for the publication of more definite intelligence in regard to this matter, and we have therefore great pleasure in giving our readers some information respecting the remarkable invention of Mr. E. Lloyd Pease, of the well-known firm of Ashmore, Benson, Pease, and Co., Limited, which we have no hesitation in characterizing as one of the greatest advances yet made in the direction of the practical realization of the ideal of the suppression of lofty guide-framing. Mr. Pease has been engaged in perfecting this invention for some months; and it is only very recently that he has been able to demonstrate its practicability in the simplified shape to which he has brought his original conceptions. We believe we are now fully justified in stating that, having satisfactorily proved by experiment the suitability of his system of guiding gasholders under the conditions ordinarily to be met with in practical working, Mr. Pease's firm are prepared to apply it to new holders, or to holders telescoped for enlargement. In the former case it dispenses with the guide columns altogether; and in the latter it renders heightening the columns unnecessary—in both cases effecting a considerable economy. In this saving of material there is no sacrifice of security, no throwing of additional strain upon the holder, no necessity for extra care and accuracy in workmanship. The holder, whether of one lift or many, is securely held both from the top and bottom curbs. It cannot possibly rise or fall unevenly. It is always freely floating on the water; the sustaining force is always acting; and there is no jamming. The guides in the tank and on the lifts are vertical, and these and the guide rollers need not be different from the fittings in ordinary use. Lastly, the cheapness of the whole guiding arrangement is such as must be the despair of future inventors in the same line to surpass.

The system is as easily applicable to holders of any number of lifts as to one; but it may be better understood by considering first the case of a single lift. The system may be regarded in two developments, the first involving a combination of a moving ring girder and wire-rope attachments, the second dispensing with the girder and making use of ropes only. The former is perhaps easier described and understood. We have to imagine then a single lift gasholder, grounded in its tank and ready for raising. It has no guide columns; only tank guides and rollers. It has on the top curb three or more goosenecks, however, very like those in ordinary use, but without the rollers, which, of course, would be useless in the absence of anything to roll against. In place of the rollers, every gooseneck carries at its outer extremity a wire rope as long as the holder is high, secured by a vertical screw-rod coupling, from which it hangs perpendicularly downwards. On the ground and round the tank lies on stout roller bearings, anchored to the ground, a circular girder of H-iron, of, say, the same strength as would be required for a column guide. By means of the rollers on which it lies, and which are in pairs, one over another, holding it securely between them, this girder can be made to move in either direction concentrically round the holder. The wire-ropes already mentioned as hanging from the top goosenecks, are brought down vertically to the top of the girder, and after passing underneath a pulley, are made fast to the top surface of the girder, lying along it, say, from left to right. From the underside of the girder, other similar ropes pass from right to left, also changing direction by means of pulleys, down to the bottom curb of the holder, where their other end is made fast.

If the sense of this description has been followed, it will be perceived that in the position supposed to be occupied by the holder—resting on the stones in the bottom of the tank—the upper guide ropes are lying with most of their length aligned with the moveable ring girder, while the under guide ropes are fully paid out and hanging at their vertical length in the tank. If now the holder is raised by gas, as it rises it takes up its top guide ropes, which, being fast to the girder, pull the latter round to the same extent horizontally and circularly as the holder goes up vertically. At the same time, the lower guide ropes are drawn out of the tank and go round with the girder. So the movement goes on, till (when the holder is full) all the upper guide ropes are fully paid out, and the lower ones are laid along the girder. As the holder falls, the reverse process takes place. The bottom guide ropes now pull the girder the contrary way, and it takes up the slackened top guide ropes as it revolves. No rope can go faster than another; and so the verticality of the holder is assured at all heights. The screw attachments permit of adjusting the ropes so that they may all be equally strained; and as their rate of motion is slow, their wear is inappreciable. It will be seen that a holder thus tied from the top and bottom is even more securely held upright than by the ordinary method of rollers and guides, because the controlling strain is *always operating*, and does not depend, as in the usual method, upon the weight of the holder happening to rest now on one side, now on another, at it rises and falls.

The second or modified development of the system consists in substituting a stout endless wire rope, held in anchored horizontal groved guide pulleys, for the solid girder. The operation is precisely the same. As the holder rises, the top guide ropes which are fastened to it by their lower ends pull the horizontal endless rope round in one direction; and when it falls the bottom guide ropes which are similarly fastened to it, pull it round in the opposite direction The advantages of substituting a wire rope for the heavy solid

girder are obvious. It is cheaper; saves weight; is much easier to fix; and as it runs straight between its guide pulleys it takes the strain better. If necessary, one or more of the guide pulleys may be made traversing on its carriage, to allow for taking up slack caused by wear.

The application of the system to multiple-lift holders is simple in the extreme. The top guide ropes remain as in the single-lift holder—passing merely from the top goosenecks to the friction rollers at the ground level, which change their direction to the horizontal. The ropes from the bottom curb of the inner lift are passed, however, over a pulley on the grip of the next lift, thence they pass downwards to a pulley on the bottom or cup of this lift, thence up again to the next grip, and so on, always ending, as in the single-lift holder, from the bottom curb to the pulley on the edge of the tank, which changes their direction to the horizontal before their ends are made fast to the endless circular rope. In this way, the inner lift rises exactly like a single-lift holder; and as each succeeding lift is cupped, the lower guiding is *always from the bottom of the lift which is rising.* Mr. Pease has made a further ingenious modification of the system to meet the case of a holder which is enlarged by the addition of a new inner lift. In this case the horizontal anchored rope, which sustains the whole, is placed upon the crown of the holder and goes up and down with it. By this device the existing columns and guides of the lower lifts are not interfered with. Of course, a single-lift holder may be guided in the same way, and thus the ground space taken up by the horizontal rope—which would in no case, however, exceed that required under the present system for columns or standards—would be saved.

We have had the opportunity of seeing all the modifications of the system just described shown by working models, the action of which left nothing to be desired; and hope shortly to see one of them in use for guiding a holder of full size. It should be explained that in multiple-lift holders guided on this system, the necessary rigidity at the ground line is provided for by radial rollers on the edge of the tank working against vertical guides on the lifts. This arrangement prevents anything like racking of the outer lifts by the strain of the bottom guide rope while the inner lifts are rising or falling.

In another column we give illustrations of Mr. Pease's system, by which any doubtful points in our description of the invention will be settled. It is sufficient here, however, to make clear the principle, which is the conversion of the vertical movement of a holder into a horizontal one, by means of tie-ropes connecting the top and bottom curbs respectively in opposite directions to an anchored endless girder or rope, free to travel round the tank.

It now only remains for us, in concluding this article, to pay a due meed of recognition to the originality of Mr. Pease's conception, and to the mechanical adroitness with which it has been made practically effective. We regard this as by far the most hopeful outcome of that study of the question of gasholder guiding from a new standpoint which has occupied the minds of engineers interested in gas-works construction for the past year or two, and which have already produced Mr. G. Livesey's Rotherhithe experiment and the published suggestions in the same direction of Mr. Gadd, Mr. Livesey, and Mr. Terrace. There are, we believe, some other contributions of the same order awaiting the fitting occasion for announcement; but we know of nothing more promising in this line than this system of Mr. Pease. Not the smallest of its recommendations is the circumstance of everything connected with it being fully exposed to inspection, and, if need arise, to repair or adjustment at all times. There is no apparent reason why the guide ropes, which could be made of mild steel, should not last as long as the sheeting of the holders to which they are fitted; but if they should require more frequent, renewal they are very cheap and the work could be easily performed. The whole cost of a set of guide fittings on the new system would be so little, that they could be tried with any new or enlarged holder at a comparatively insignificant charge; and there is the advantage with them that if not liked, there would be nothing structurally to prevent the substitution of guide columns and rollers of the usual pattern. The invention is patented.

There is, of course, one important point in connection with the working of the system which awaits settlement by experience. That is the question of friction, as translated by pressure. There is no reason for supposing, however, that the friction of the light wire ropes and pulleys required in this system of guiding will prove to be anything considerable. The motion is very slow, and the weight can be distributed between any number of points. will be needed as compared with the present system; and even It is thought that not more than half the number of lines of guidage this number may be excessive. But this is a matter that can only be settled by actual trial. It is worthy of remark, from the point of view of the scientific observer of this order of structures, that the adoption of the system would give greater facilities than any now existing for determining the actual staying power required by a gasholder. Dynamometers could be interposed in any of the guide ropes at convenient points, which would show how much strain was exerted at any time in maintaining the holder vertical under the stress of its own overturning moment and the impulse of a gale of wind.

[The bulk of this article has been in type for many months, awaiting the completion of Mr. Pease's foreign patent arrangements, which have only now permitted the publication of a detailed description of his invention.]

HOW THE "JOURNAL" INVESTIGATES NOVELTIES.

From time to time invitations to view alleged novelties in gas manufacture reach the office of the Journal, and the result of our visits of inspection, when fruitful, are communicated to our readers in due course. These invitations are of all styles of pretension, from the politely-worded request from a City financial firm to take part in a "Press View" of something which may or may not be worth looking at, but which is to wind up with a luncheon that will certainly be worth eating, down to the modest offer to exhibit something remarkable in the way of gas-regulators if we will take the trouble to "step round" to some out-of-the-way factory in Hoxton or Rotherhithe, which probably means wasting half a day to no purpose. It should be unnecessary to remark, by way of explanation, that while the most humble proffer of information is never scorned for the manner of its submission, the most pretentious bid for a good "Press notice" gains nothing from its accompaniment of "chicken and champagne," to be partaken of in company with a crowd of reporters for the daily press, who in all probability know absolutely nothing respecting the matter they are invited to introduce to the world. Indeed, we generally prefer, if there is reason to believe that one of these Press "feeds" is in the programme of an "inspection," to pay an unexpected visit to the scene of action a day earlier or later, for the purpose of ascertaining quietly what the project consists of. Sometimes we find that the blazoning of an invention or scheme is in inverse ratio to its intrinsic value. Occasionally one may find in a cellar or an obscure office a process which deserves to be dragged into prominence. As a rule, however—although this is a consideration that never affects our treatment of the exhibited thing—we find that the character of an invention or project is directly proportional to the reputation of the men we hear of in connection with it. If we hear of a so-called new gas process, and the people identified with it, however apparently respectable, are strangers to the world of gas engineering, the thing is invariably "hollow." This remark may look like a truism; but there is no real reason why it should be so, or why improvements in gas manufacture and gas apparatus should not come from outsiders. As a matter of fact, however, it may be supposed that straightforward inventors, if unconnected with the profession, try to get advice from competent authorities, and so one does not hear anything of their proposals until these have been admitted by professional advisers to be worthy of attention. This does not prevent charlatans from rising to the surface from time to time, and gaining the patronage of speculators who fancy they see a chance for making money out of schemes which appear plausible to an ignorant person, but which an expert condemns at the first glance. The first step, of course, in the way of palming off anything upon the public is to prime the newspapers. This ought not to be so easy a matter as it is; but it is a pitiful fact that almost all the daily and weekly newspapers in London, and most of the technical journals, detail for this duty of inspecting and reporting upon new industrial projects men with no suitable technical knowledge, and often with a gullibility which is really infantile. Then the ingenious gentleman who pulls the strings selects from his sheaf of "Press notices" the most favourable from his point of view, and sends reprints to the other journals, in which they are reproduced as extracts from *The Times*, or some such authority.

We have recently had several examples of the way in which this little business is worked, which, although not very instructive in the technical sense, may be described for the benefit of those of our readers who may be curious as to the manner in which inventions are "financed" now-a-days. The first is the "new atmospheric gas-burner" of Mr. H. Cox, which was noticed by us on p. 600 of the present volume, and was very pertinently criticized by Mr. Thos. Fletcher in last week's issue. Our notice was the one which has gone "the round of the papers," as the phrase has it; but carefully omitting any expressions of recommendation. We received a special invitation to view this novelty at the offices of the agent, Mr. Terraneau, of No. 123, Pall Mall, and went to see it. We found a counter covered with handbills laudatory of the patent "Boudoir" gas-stove; and in the middle of the room an object like a pile of two or three circular canary-birdcages one on the top of another, inside which was an old-fashioned mushroom-shaped atmospheric gas-burner. Upon inquiry as to what constituted the great invention which the Press and the public of London were called to admire, we were shown a brass cylinder with slotted sides, containing a gas-jet, the cock of which was so arranged as to open and close the air admission slots proportionately with the opening and closing of the gas-way. Then ensued something like the following colloquy:—"Q. What is the benefit of this arrangement?—A. Economy of gas, avoidance of smell, prevention of firing-back. Q. How does it effect these things?—A. Cannot tell; but it does so. Q. Have you any report of a test by any independent authority which bears out these claims?—A. No; but one is being made. Q. By whom?—A. Not at liberty to tell. Q. Then the claims rest on your statement alone?—A. No; you can make a test here and now, if you like. Q. I don't undertake testing; but suppose I say that there is nothing in the construction of the burner to justify your claims, and that the idea is as old as the hills, the modern self-adjusting atmospheric burner being in every respect superior to it, what evidence can you offer to the contrary?—A. We have satisfied ourselves that the burner is all that we say for it." There being no way out of this deadlock, we departed marvelling greatly.

Our pilgrimage for the day was not ended. We had also been invited to Willis's Rooms, the historic place of social assembly

in St. James's when George the Fourth was King, to witness the application of "a means of destroying the noxious fumes evolved from coal in houses and factories." On arrival, we mingled with a small but steady stream of visitors, who were received by a number of courtly gentlemen in two rooms, each warmed by a blazing fire, one of which was supposed to exemplify the great invention, while the other was the "awful example." The first was a modern register grate, in which was a large and bright fire roaring up the chimney, so that one could not say whether it was smoking or not; while the other was a long old-fashioned affair containing a languid fire, smoky, but not excessively so. The burden of the exhibitors was, of course, "Look on that picture and on this." Being seized upon by two or three persons in attendance, profusely offering information, we were compelled to take part in a second discussion strangely repeating the tenor of the first. "Q. What is the nature of this invention?—A. The coal is treated with a solution of this powder, of which a 5-lb. tin is sufficient for 2 tons of coal." The powder referred to was of a grey colour, with a slight odour of ammonia, and when a pinch was thrown upon the fire, it burnt like saltpetre. "Q. And is this all?—A. This is all. It is the grandest invention of the age, saving 20 per cent. of coal without the slightest outlay by the consumer. Q. Where does the saving come from?—A. From the consumption of smoke. Q. But does not Sir Frederick Bramwell say that the densest smoke that ever comes from the funnel of a steamer only represents an actual weight of 9 lbs. of carbon per ton of coal consumed in the furnaces?—A. I think, now you mention it, I have heard something of the kind. But then, you see, with this invention there are no cinders; all the coal is burnt to ashes. Q. There is no need to talk of cinders in connection with a properly designed furnace or even fire-grate. Have you ever heard of anything of this nature being tried before?—A. Never. Q. Have you inquired?—A. No; we believe it to be quite original. Q. Did you ever hear a saying that 'there is nothing new under the sun?' This remark was not made for the first time yesterday; but it is true to-day and will be true for to-morrow. Good-day."

With this we turned once more toward Fleet Street, marvelling again that crudities like these should blossom out of the dust again and again, while many a true inventor whose name is now identified with the industrial progress of the world has trodden the flags of London streets hungry and despairing of that help and recognition which did not come to him until, in Dr. Johnson's bitter words, he was "indifferent, and could not enjoy it; solitary, and could not impart it; known, and did not want it."

THE OIL LIGHTING AT ERITH.—The experiment in the use of oil for public lighting at Erith appears to be still far from satisfactory. We learn that the Local Board had to report about 60 lamps not alight during the summer quarter, and to deduct between £7 and £8 from the account of the contractors, the Defries Safety Lamp and Oil Company, Limited. With regard to the future operations of this Company in competition with gas undertakings, it may be mentioned here that an order for the winding up of the concern, which was started with a capital of £150,000, has just been made by Mr. Justice Denman.

THE COZE SYSTEM OF INCLINED RETORTS IN AMERICA.—Mr. J. B. Taylor, the Engineer of the St. Louis Gas-Works, lately gave a representative of one of the local papers some particulars as to the working of a setting of five retorts on M. Coze's inclined system, which, as our readers are aware, is about to be tried at the Brentford Gas-Works. Two men work the setting; but Mr. Taylor explained that, if they had two more beds, the same men would be able to work them—making 15 retorts for two men, as against 9 retorts for three. He pointed out the advantage of the inclined arrangement in the operation of drawing. By simply opening the end of the retort, and giving the mass of coke a slight breaking-up with a long pointed bar, it slides out in a few seconds by its own gravity, allowing the door to be closed at once; thus preventing the admission of too great an amount of cold air, to chill the retort and cause waste of fuel. The inclined retorts are 11 ft. 3 in. long, against 9 feet, the length of the horizontal retorts; and the charge is 500 lbs. in the former case, as compared with 330 lbs. in the latter. The charging operation takes ten seconds by the Coze system, and one minute by the ordinary plan.

AMERICAN GASLIGHT ASSOCIATION.—The programme of business for the annual meeting of this Association, which opens in Baltimore on the 16th inst., has received several items of interest in addition to those noticed last week. Professor E. G. Love, the Gas Examiner for New York, has promised to read a paper on "Gas Calorimetry," which will form a valuable subject for the members' consideration; and the "question-box" has been made the vehicle for eliciting the views of the meeting on the following queries:—"Shall fire-bricks and tiles be laid wet or dry?" "What composition of gas will give the highest illuminating power when burned with a common fishtail burner consuming 5 cubic feet per hour, and convert all the carbon into carbonic acid?" "What specific gravity of oil will yield the greatest amount of gas with the highest illuminating power?" "What chemical change takes place when a liquid hydrocarbon is exposed to a high temperature and made into a permanent illuminating gas?" It is possible that before the day of meeting other questions will be submitted; so that, altogether, the proceedings promise to be full of interest for gas engineers and managers on both sides of the Atlantic. The comfort of the members is being arranged for by the Secretary, Mr. C. J. R. Humphreys.

Notes.

ESTIMATIONS OF TEMPERATURE BY COLOUR.

An illustration of the manner in which erroneous estimations of the temperature of retorts, flues, and heated surfaces in general may be made when their colour only is observed, without regard to their nature, has been given by Herr Braun in *Wiedemann's Annalen*. It is stated that if a part of the surface of a porcelain object is covered with the black pigment employed by painters on porcelain, and the whole placed in a muffle until it attains a red heat, the porcelain will begin to emit light; but the black spot will be seen to be darker than the rest of the surface. As the temperature is increased, the luminosity of the porcelain grows more intense, so that the spot tends to disappear. At a temperature of about 800° C., it is no longer visible. If, however, at this point the interior of the muffle is lit up by a gas-jet, the spot will re-appear. By still further raising the temperature, the spot again becomes visible; but this time it will be brighter than the other surface, and at from 1000° to 1100° C., it appears like a white spot detached from the rosy ground of the incandescent object. If the muffle is once more lit up by a gas-flame, the spot will still show more sombre than the surrounding surface. The phenomenon depends upon the semi-transparency, under heat, of the body operated upon, and may be adapted as a lecture experiment to demonstrate that the actual temperature of two heated bodies of different natures need not necessarily be what their respective colours would indicate.

SEPARATE AIR SUPPLY FOR GAS-BURNERS.

As an example of the recrudescence of old ideas which continually deceives searchers after novelty, we may cite the project of M. Edel, recently described in *La Nature*, for supplying gas-burners with air-pipes to render them independent of the atmosphere of the rooms in which they are used for lighting. It is argued that the air of closed apartments is subject to "rarefaction" by the combustion of gas; and that for the advantage of the illuminating power of the gas, as well as to prevent the corruption of the air produced by incomplete combustion, it is desirable to supply the burners with fresh air from outside. Accordingly, on the exterior of the wall, M. Edel makes a cavity to serve the purpose of a reservoir of fresh air, closed on the outside with louvres inclined at a reverse angle to that ordinarily adopted for blinds, in order that puffs of wind shall not affect the flames of the burners. Any other wind-baffle will, of course, answer the purpose. From the reservoir a pipe is taken alongside the gas-pipe, and terminates at the burner in a glass cylinder wherein the gas is to burn. Nothing is said about the escape of the products of combustion, which M. Edel seems to have overlooked; and, of course, there is nothing to make the air flow in the desired direction. How this arrangement is to improve the illuminating power of the gas burnt remains a mystery. In this crude idea is perhaps to be found the germ of such a complete system of controlled air supply to gas-burners as the Methven-Sugg arrangement, in which the air is propelled to the point of combustion after it has been artificially dried, and in which the expulsion of the products of combustion is provided for.* Unfortunately for M. Edel's hopes of future development, however, in this case the completed system antedates the germ.

CLAYS AND PUDDLE.

Writing on the suitability of various kinds of clay for making puddle for use in embankments, tanks, &c., to retain water, Mr. W. Gallon remarks that the absence of precision that is notable in specifications of puddle work is due to the fact that most kinds of clay will make good puddle when properly treated. The essential point is that the puddle shall be impervious to water; and no special purity is required in the raw material to secure this quality in the tempered product. Working the clay well up with water so that its original formation is broken up and a new arrangement of particles brought about, with sufficient addition of water to fill every pore, is the main thing to be attended to. It may be regarded as peculiar that puddle, although prepared for the purpose of excluding water, should require a large quantity of water for its preparation. Tempering clay for puddle is greatly facilitated by exposing the material for a long time to the air, especially in winter, when atmospheric influences will break it up better than even grinding in a mill, and the subsequent labour is greatly reduced. Clays well suited for puddle are opaque, not crystallized; they exhibit a dull, earthy fracture, and when breathed upon exhale a peculiar faint smell termed argillaceous. They are unctuous to the touch, free from grit, and readily form a plastic paste with water. The important properties of a good puddle clay are tenacity and power to retain water. The former may be tested by working up a small quantity with water into a thoroughly plastic condition, and forming it by hand into a roll about eight to ten times its thickness. If such a roll does not break when suspended by one end while still wet, the material may be passed as of ample tenacity. To test its power of retaining water, a sample cubic yard or two should be puddled and formed into a basin, which should be filled with water and covered over for 24 hours to prevent evaporation. The result of this examination should show whether the clay can be relied upon to produce a water-tight puddle. Very good puddle may be made with clays differing widely in their proportions of pure hydrated silicate of ammonia, which is the basis of all varieties of natural clay.

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* See "Register of Patents" to-day, p. 702.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXIX.

There is rather too great a tendency, especially among outsiders who have acquired sufficient chemical knowledge to enable them to understand the theory of gas making, to assume that practical endeavours have always been confined to the use of coal, with the exception, perhaps, of the water gas process, to the exclusion of other materials. As a matter of fact, however, from the commencement of gas lighting it was known that almost anything of an organic character—such as animal matters containing fat, vegetable substances containing oil or resin, and carbonaceous minerals—were capable of yielding gas when distilled in retorts. But a little reflection will show that there are a large number of requirements, some commercial (such as the price and quantity of the material available), others of a technical character, having reference to quality and yield of gas, proportion of impurities and practicability of removing the same, &c., that must be met before any material can be adopted on the large scale for the manufacture of gas. In the present chapter, we shall see that no material at all likely to be suitable has been overlooked.

In many parts of the world where coal is dear and wood comparatively cheap, the latter is used as a staple material. The composition of wood gas has already been noticed. As far back as 1851 it was reported that the railway station at Munich was lighted by means of wood gas. Only one iron retort was used; and this received a charge of 1 cwt. of split wood every 90 minutes. The yield of gas was at the rate of 11,000 cubic feet per ton of wood employed; and the quality about 16 candles. The retort, if worked continuously, would therefore be capable of producing nearly 9000 cubic feet of gas per day. The residual products included 4 cwt. of charcoal and 1 to 1½ cwt. of tar per ton of wood. M. Jeaneney gives an account of a visit to a town in Germany that was lighted by means of wood gas.* The cost of the gas, exclusive of interest on plant, was 3s. 6d. per 1000 cubic feet. One bed, containing two retorts each 21 inches diameter, was capable of producing 24,000 cubic feet of gas per diem. The wood used consisted of a species of fir—the roots, base, and other resinous parts of the trees being selected, if possible; and the yield was 11,000 cubic feet of gas per ton. The illuminating power was very poor, not exceeding 7 or 8 candles; and this may be due to the presence of carbonic acid, as mention is made of the use of three large wet-lime purifiers, furnished with agitators worked by machinery. In all cases it will be observed that a large quantity of carbonic acid is amongst the products from the distillation of wood. In dealing with statistics relating to this substance, therefore, it is necessary to ascertain whether the gas was measured before or after purification, and also whether the wood was used in its virgin state or after being dried by artificial means. At a town in Austria, M. Jeaneney found that the cost of making wood gas was 2s. 9d. per 1000 cubic feet; the quality being not much better than the foregoing. The retorts were heated by wood; and there were three in a setting, each 19 inches wide and 8 feet long. Each retort was charged every two hours with 125 lbs. of wood; and the fuel used for each setting was a ton per day. The wood used was similar in quality and price to the preceding, but the make was only about 8000 cubic feet per ton. These examples are fairly representative of others cited. The expense of lime for purification was great, as the gas contained 9 to 18 per cent. of carbonic acid. In some cases the charcoal produced is valueless, in others there is a ready demand for it. Each ton of wood also yielded about 6 cwt. of vinegar, and 1 cwt. of tar. Taking an average of the various towns supplied, the quality of the gas obtained from wood was about two-thirds that of coal gas.

About sixteen years ago, attention was directed to the use of cork refuse as a gas making material in France.† Experiments showed that the yield of gas was nearly 18,000 cubic feet per ton; and the quality and purity were satisfactory. The process received honourable mention at the Exhibition of the Industrial Arts, 1879. A well-known French Engineer, M. Emile Durand, inspected the process, and while admitting the possibility of producing gas of good quality from cork, he was rather dubious as to the practicability of the scheme. The only residual that he was shown in the course of his visit, was a very light and friable coke, that would need compression before it could be used, and which represented about 20 per cent. in weight of the original material left in the retort. He also questioned the possibility of collecting the material in large quantity, and retailing it to gas makers at anything like a remunerative price.

A paper on "Wilkinson's Process for Manufacturing Gas from Wood," published in America in 1881, which has already been referred to in these articles, states that moisture, even in the harder varieties of wood, is present in such large proportion as to cause a lowering of the temperature in the retorts, sufficient to favour the production of liquid products at the expense of the yield of gas. And the wood gas also contains a large proportion of carbonic acid, which may even exceed 25 per cent. These two causes have led to the practical abandonment of wood as a gas making material, except under unusual circumstances, by distillation in the usual way; though, of course, it might be used, like any other carbonaceous material, for the production of fuel gas. The essential feature of Wilkinson's process is said to consist of the reduction of the carbonic acid to carbonic oxide, and at the same time of the decomposition of the tar, acids, and other liquid products into gas. After the first charge of wood has been carbonized, the residual charcoal, instead of being drawn, is pushed backward into an enlarged part of the retort provided for its reception; and as the gas eduction pipe is beyond this enlargement, the gas from the next charge is compelled to pass through the bed of charcoal before it can leave the retort. The heat is maintained as high as possible. The gas thus formed is said to be free from nitrogen in the form of ammonia, sulphuretted hydrogen, carbon disulphide, or tar, and to contain very little sulphur in any form. There is an excess of charcoal, which requires to be drawn out twice a day. But there appears no reason why, instead of drawing this excess, it should not be decomposed by the addition of steam. About 36,000 cubic feet of gas are said to be obtained from a ton of wood, the cost of which is about 14s. 6d. The cost of the gas is thus 5d. per 1000 cubic feet. It is valueless as an illuminant, but may be used as a diluent for rich gases.

In a paper that was read before the British Association of Gas Managers in 1873, by Mr. Henry Gore, a full description is given of an apparatus designed by the author for the purpose of manufacturing gas from wood, and enriching the same by means of resin or other suitable material, for use in the city of Mexico, where coal costs £5 per ton. Each setting comprised three round retorts, each 13 inches diameter by 9 ft. 6 in. long. The gas from the two lower retorts was conveyed into the top retort, by suitable connections on the mouthpiece; and after passing through the top retort escaped by a descending pipe to a hydraulic main placed at the ground level. The enriching material, when it was used, was admitted at the front of the top retort. The two lower retorts were charged with a species of resinous pine wood, obtained by splitting up the roots or stumps of the pine trees after the main portion of the trunk had been cut down. If carbonized at a bright red heat, this material yielded nearly 12,000 cubic feet per ton; but the quality was only 10 candles. Ordinary wood gave worse results, both in respect to quality and quantity. The gas required a costly purifying process to free it from the large quantity of carbonic and pyroligneous acid given off by the wood; and for this reason the author discarded wood in favour of an improvised method of making water gas. He found it worth while, however, to return to wood, with resin as an enriching material; and the city was lighted with gas made in this manner for five years. Mr. Gore visited Germany for the purpose of obtaining information about wood gas. With one or two slight modifications, he found the apparatus used to be similar to that employed for coal gas. It was regarded as essential that the wood should be thoroughly dried or baked before use, the retorts were maintained at a bright cherry-red heat. The quality of the gas varied according to the size of the burner; rather larger burners than those used with coal gas being necessary to secure the best results. For instance, with a consumption of 5 cubic feet per hour, the light yielded was only 9 candles; but with a consumption of 7½ cubic feet per hour, it was 17½ candles. The engineer of the gas-works at Coburg had found, as the result of practical experiments, that the wood gas was 22 per cent. cheaper than coal gas, provided that the wood was thoroughly dry, and that none of its essential oils had been extracted. The author found that by passing the wood gas through a second red-hot retort, its quality was improved, but at the same time the proportion of carbonic acid was increased. In places where wood and lime were cheap and abundant, wood gas might be used with advantage.

In parts of the world where large quantities of sawdust are formed, and carbonaceous fuel is at the same time costly, it has been found practicable to turn sawdust to account as a gas producing material. At Deseronto (Canada) Mr. Geo. Walker uses a modification of the Halliday process* for distilling sawdust as a source of acetic acid, tar, &c. The retorts are cast iron, round in section, 9 ft. 6 in. long by 12 in. diameter, and fitted with an iron archemedian screw conveyer, which causes the material to pass slowly through the retort. They are fed from the front by a hopper with feeding screw, &c.; and a sufficient quantity of sawdust is always kept in the hopper, to prevent either ingress of air or escape of gas. From the back of the retorts the carbonized residue drops down into an air tube or charcoal main, placed at right angles with the retorts, and also fitted with a screw conveyer, by which it is conveyed into a suitable air-tight receptacle, from which it can be removed as desired. The gases pass up an ascension pipe at the back of the retort, and are treated in the usual way. With thoroughly dry sawdust, the careful exclusion of air from all parts of the apparatus, and proper heats, the quality of the gas is from 12 to 15 candles. With a crude experimental apparatus, Mr. Walker claims to make 20,000 cubic feet of gas per day from two tons of dry sawdust, using about a cord of wood for fuel. If the sawdust is from resinous wood, the quality of the gas is increased. The carbonized dust is said to be suitable for gunpowder and other purposes; and there are the usual residuals from the distillation of wood, such as acetic and pyroligneous acids, methyl alcohol, &c.

Mr. Bicknell† claims that the apparatus as above described is not satisfactory, because it fails to bring every portion of the sawdust into contact with the red-hot sides of the retort. As the screw revolves, a layer of sawdust is wound round the screw and carried forward *en bloc*, and only the exterior part of it actually

See Journal, Vol. V., pp. 447, 472. † *Ibid.*, Vol. XXXVI., p. 808.

* See Journal, Vol. XLIII., p. 865. † *Ibid.*, Vol. XLIV., p. 22.

touches the retort. For this reason he prefers to feed the sawdust by means of a piston motion, into a pan-shaped retort, furnished with rakes and scrapers that rotate round a shaft in the centre. This arrangement is so devised as to spread the material in a very thin layer on the bottom of the retort, and also to stir it about, thus securing complete carbonization. The material being carried by the machinery round the whole area of the retort, is at last brought to an opening, through which it falls into a suitable cooling chamber. The gases are conducted through a superheating chamber, and afterwards enriched by an admixture with vapour of oil in the proportion of 2½ gallons of oil (*i.e.*, petroleum) to 1000 cubic feet of gas. The result is a 24-candle gas. The operation goes on automatically so long as the machinery is at work; and one man attends to the whole. The yield equals 13,700 cubic feet of gas per ton of sawdust, including that afforded by the oil.

Mr. Walker,* replying to Mr. Bicknell, claims that the defect credited to his apparatus by that gentleman does not exist; and states that the size of his screw, and the speed of rotation (about once a minute) are so proportioned as to prevent the formation of anything like a solid mass of sawdust, and to stir and mix the material thoroughly as it travels through the retort. He had tried an apparatus such as that described by Mr. Bicknell, but found it impracticable to keep the retort from cracking. He therefore discarded it in favour of his present arrangement. He also points out that, whereas Mr. Bicknell aims at getting a poor gas to be afterwards enriched by oil, his object is to make a gas that will not require subsequent enrichment. The reasons which have led to the failure of previous schemes for making gas from sawdust, says Mr. Walker, are the endeavours to treat it *en masse*, and the omission to secure thorough drying before use.† Ordinary pine-wood sawdust, carbonized at 1500° Fahr., will yield 12,300 to 15,700 cubic feet of gas per ton of the dried material. The quality is 15 candles, specific gravity ·590 to ·620, and composition about 7·5 per cent. of illuminants, 33 per cent. hydrogen, 27 per cent. marsh gas, and 32·5 per cent. carbonic oxide. Ordinary saw-mill waste contains 50 per cent. of water; and the quantity of fuel required to dry it is about one-sixth of its weight of soft wood. The power required for the machinery is about ½-horse power per retort; and Mr. Walker estimates the cost of making 1000 cubic feet of gas at 1s. 6d., which is nearly covered by the receipts for residuals. This does not include anything for the price of the sawdust, so it would appear that the gas can be made for the value of the sawdust.

THE DINSMORE PROCESS AT WIDNES.—Mr. Isaac Carr, Gas Engineer of the Widnes Local Board, has lately reported to the Gas Committee on the progress of the Dinsmore system at their gas-works. He states that the new bed of retorts in No. 2 house continues to give satisfaction. Two weeks' working with Abram Arley slack resulted as follows:—Gas made per ton, 11,300 cubic feet; average illuminating power, 20·74 candles; tar used per ton of coal carbonized, 4½ gallons. Mr. Carr adds that the alteration of taking the tar into the duct in a gaseous instead of a liquid form, simplifies both the plant and the working operation; no extra care or attention being required over the ordinary stokers' duties. At the close of September there were two beds of retorts working on the Dinsmore system at Widnes. We learn that two more are to be started during this month, and another two in November; making in all, this season, 41 mouthpieces working on the Dinsmore plan.

RETIREMENT OF THE CHAIRMAN OF THE LEEDS WATER COMMITTEE.—Mr. Alderman Woodhouse, the Chairman of the Leeds Corporation Water Committee, presided over the deliberations of that body for the last time on Tuesday; he having decided to retire from municipal life. During his career as Mayor, Alderman, and Chairman of the Water Committee, he has rendered signal service to the borough, and has earned the respect not only of his civic brethren, but of the ratepayers generally. At the meeting of the Committee on Tuesday, his colleagues passed a resolution heartily thanking him for the valuable and efficient services he has rendered to the Committee as Chairman for so many years, and for the time he has devoted to, and the interest he has taken in the work of the Committee during the period he has been connected with it; and they placed on record an expression of their deep regret at the prospect of being deprived of his services, in consequence of his approaching retirement from the Corporation.

ADOPTION OF THE OXYGEN PROCESS OF GAS PURIFICATION AT RAMSGATE.—At the meeting of the Ramsgate Corporation last Wednesday, a recommendation of the Gas and Water Committee, to the effect that Mr. Valon's oxygen process of gas purification (which, as our readers are aware, has been for some months on trial at the works) should be definitely adopted, was under discussion, and was eventually agreed to. The Chairman of the Committee (Mr. Alderman Pygott), curiously enough, was the only member who withheld his consent to Mr. Valon's proposals when they were under discussion in committee; but, after careful consideration, he coincided with his colleagues. Mr. Valon was instructed to obtain the necessary apparatus to work the process, which, during the six months it has been in operation, has enabled him to dispense entirely with cannel. We regret that, owing to the crowded state of our columns to-day, we are compelled to hold over our report of the proceedings in the Council, in the course of which some interesting points in favour of the system were brought forward.

* See JOURNAL, Vol. XLIV., p. 152. † *Ibid.*, p. 460.

Technical Record.

NORTH OF ENGLAND ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held last Friday at Doncaster. Pleasant weather favoured the gathering; and the day was spent in a very satisfactory manner. The members travelling from the north reached Doncaster a little before eleven, and were conveyed in a wagonette to the gas-works, where they were received by Mr. Robert Bridge, the Engineer, and this year's President of the Association. An excellent luncheon awaited the visitors; and after this refreshment, the party were conducted round the works by their host. The works are situated on a navigable arm of the River Don; and the Corporation, who have, as Mr. Bridge subsequently explained in his address to the members, enjoyed somewhat unusual advantages in the conduct of the undertaking, have taken the wise precaution to obtain a large tract of land for future extensions. Some portion of the works is of ancient construction; but additions have been made from time to time, and the works, though in various stages of development, are now compact and well-arranged. All the coal comes direct from the pits in barges, which are moored close to the retort-house, and unloaded rapidly, and at comparatively little cost. The system adopted is that of payment by the piece. Six men are engaged upon the work, and the money given to them for clearing a barge (about 80 tons) is 24s. Tramways are carried down each side of the retort-house at a sufficient elevation to admit of the free tipping of the coal, and with projecting stages at the river end. A crane, actuated by a 6-horse power "Otto" gas-engine, lowers the empty corvels into the barge, and lifts them, when filled, on to one of the two stages whence they are run to the spot at which the coal is tipped. Four of the gang load, while the other two attend to the tipping of the little wagons; and the operation goes on quickly and smoothly from start to finish. In the retort-house, there are two kinds of settings. The more modern are circular through retorts, in settings of six; and by far the larger number are of this kind. There are, however, one or two older benches of D-shaped single retorts in settings of five, which have been in use for a considerable number of years, and which are remarkable for the antiquated, though simple style of their fittings. The present make of the works is about 350,000 cubic feet per day; and the annual output 56,000,000 feet. In the exhauster-house, there is space for the doubling of the present plant. Mr. Bridge uses both oxide and lime in purification; passing the gas first through the oxide and then through lime. The ammoniacal liquor is converted into sulphate on the premises. The plant for this purpose consists of an old apparatus on the Abbott principle, and a more modern one on the Feldmann plan, but with certain modifications. The new apparatus is capable of dealing with 100 gallons of liquor per hour, and is found perfectly efficient both in regard to the product and the thoroughness of the extract of the salt. Of four old holders, only one is now in use. A second was in course of demolition on the day of the visit, while the tank of the third is used for the storeage of tar. The one now in use will hold 200,000 feet of gas, and the storeage is supplemented by a modern holder, with a capacity of 500,000 feet.

The next item on the *agenda* was the meeting, which, by the courtesy of the Mayor, was held in the Council Chamber of the Guildhall. The PRESIDENT having taken the chair,

The HON. SECRETARY (Mr. W. Hardie, of Newcastle-on-Tyne) read the circular convening the meeting.

NEW MEMBERS.

Mr. Joseph Lee, Secretary and Manager of Haydon Bridge Gas-Works and Mr. W. A. Bowman, Manager of the Whitburn Gas-Works, were elected members of the Association.

AN ADDRESS OF WELCOME.

On the invitation of the President,

Alderman WAINWRIGHT rose and said he had been asked—he did not know whether in his capacity as ex-Mayor or Deputy-Mayor or Chairman of the Gas Committee—to offer the members a word of cordial welcome on their visit to Doncaster. The Mayor of the borough was away on a well-earned holiday. Therefore he had been deputed to act in his stead; and it was with the greatest pleasure that he welcomed such an intelligent body of gentlemen to the town. There could be no doubt that the profession in which they were engaged was of great interest to the community generally. Gas had had a fair run for a considerable number of years; and it did not appear to be in any danger of being driven out of the field. He was glad, however, to see that the gas managers and engineers of this country were fully alive to the competition which they had to meet. He noticed the other day that Sir F. Mappin, in addressing the shareholders of the Sheffield Gas Company, of which he is Chairman, referred to this question of competition with gas, and said that the electric light might come and water gas might go, but shareholders of gas companies might rest assured that their 10 per cent. would go on for ever. That was a roseate view of things at all events, and must be very pleasant indeed to gas managers. This was a question which he (Alderman Wainwright) was not able to discuss; and he should merely content himself with repeating his words of cordial welcome to the town of Doncaster.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—In electing me as your President, you have conferred an honour upon me which I highly appreciate, and for which I tender you my warmest thanks. Proud as I am of the

position, I fear I shall not, in the remarks I am about to offer, say anything to justify my selection; but I shall do my best to lay before you a few points bearing upon our industry, which, if they first of all stimulate thought and then action, I shall feel amply recompensed for any little trouble I have been at in selecting and linking these points together.

I have nothing novel or original to submit for your consideration. Research into the laws that regulate the production and formation of gases is of the utmost importance and value; but in order to perform this work satisfactorily, three things are essential—the trained and well-balanced mind, ample leisure, and plenty of funds. Now, the older members of this Association do not require to be reminded that technical training-schools did not exist in their younger days, when the receptive faculties were keen; and that consequently they did not enter upon their duties as managers of gas undertakings as fully equipped in technical detail as the generation now coming to the front. It is to their credit, however, that they have, as a rule, met and overcome difficulties which their successors will never be called upon to contend against. But even assuming that a man entered upon his duties with a fair knowledge of physical laws and of the chemistry of the compounds of coal gas and its bye-products, if he is to apply that knowledge to secure present and future benefits to his employers, he must have leisure to prosecute his projects; and, having arrived at certain definite conclusions, he must have the means to give effect to them. I am afraid that, in the majority of works in this country, the leisure to experiment is difficult of attainment, and the funds to demonstrate are not always forthcoming.

We live in go-ahead times. Shareholders want a quick return for their money; and members of corporations apply profits in relief of rates, not always because they believe the principle is right, but in order to secure for themselves popular favour at municipal elections. The servant of these bodies, therefore, must be upon the alert to avail himself of the discoveries made by more fortunate brethren; and while he keeps one eye upon the results flowing from original research, he must keep the other eye upon their commercial advantage. Not only has he to do this, but he must never forget that the field of artificial lighting is not now entirely in the possession of gas companies. The electric light, as a powerful illuminant, seeks to supplant gas-lamps on the public thoroughfares; and the incandescent electric lamp and the much-despised oil-lamp are worming themselves into favour with certain classes in the domestic circle. Recently, too, water gas has threatened to oust coal gas from the manufactory, and to try conclusions with other illuminants in lighting large buildings. I am, as I have already indicated, in the unfortunate position of not being able to submit any considerations founded upon original research upon these subjects; but, in lieu thereof, I propose to occupy a portion of your time in giving expression to some thoughts which have occurred to me in connection with them.

First, then, with regard to electric lighting. If anyone takes the trouble to read the record of this system of lighting, from its meteor-like appearance in 1878 or 1879 down to the present moment, he will be astonished, not only at its commercial fluctuations, but at the progress it has made. The financial convulsions which succeeded its advent were not long in subsiding. In a brief space of time, fortunes were lost and made. The outburst was succeeded by a calm. Although Stock Exchange sharpers could no longer delude the public with glowing accounts of the future of the electric light, yet scientists who had set their minds to the solution of the all-important problem of how the electric current could be manipulated, did not rest from their labours. From time to time, they have made discoveries in the direction of cheapening the cost of production, and improving the steadiness of the light. It would not have been very creditable to Science had advances not been made. The ablest physicists and mathematicians of the century have been working at the problem from various points of view. The steam-engine to drive the dynamo has been made as perfect as human ingenuity can suggest; the dynamo has been improved, so that now much superior results are obtained at a less expense than was possible two or three years ago; and last, but not least, the introduction of transformers enables electricians who believe in sending out a high potential current from a central station, and thereafter to distribute it at low pressure to customers, to give effect to their ideas. This system is said to be more dangerous to work than the other, of supplying a low potential current from a variety of stations. But both systems are to be employed in London; and experience will soon tell which is the better and more economical. Mr. Ferranti, the Electrician of the London Supply Corporation, is the apostle of the high initial potential system. The works of this Company at Deptford are on a gigantic scale. Arrangements have been made to supply over 2 million lights of 10-candle power each. When I mention that there are six or seven other companies, each preparing to supply hundreds of thousands of similar lights, we must conclude that there is to be serious competition for public and private lighting. These facts stare gas manufacturers in the face; and we must admit that they are ominous. That important advances have been made in electric lighting, must be frankly admitted; and credit must be accorded to the electricians who have, by their inventions, enabled these advances to be made.

While I am prepared to make this admission, it does not follow that I think the new illuminant is likely to injure the gas industry. With all its advances, and with all the cheapening processes that have been brought into play, the electric light is still twice as costly as gas, even when gas is consumed in the wasteful way that widely obtains. And if the cost per unit of light is taken, and if we employ the latest types of regenerator lamps in making comparisons, I unhesitatingly affirm that the electric light is four or five times more expensive than gas. I reason from this that the electric light will not interfere with the prosperity of gas, except in a limited sense. A certain section of the community will doubtless adopt the light. It is new, it is fashionable, and "faddists" say that it is healthier than gas. But, with the great section of the British public, novelty has few charms when it means additional annual outlay; nor does the idea of being in the fashion with light exercise much influence upon merchants, whose eyes are constantly fixed on the money columns of their ledgers. Those who argue in favour of the electric light on sanitary grounds know that, where incandescent lamps are used in a room, there is an absence of ventilation. I may say that I recently heard a gentleman speak of a certain hotel in London, the dining-room of which is lighted with glow lamps. He said it was so stuffy, that gas had to be used to improve the ventilation. When we consider the light itself, we cannot give it unconditional approval. The lamps are said to give out light equal to 10 or 16 candles, as the case may be; but it is notorious that, after they have been in use for some time, the intensity of the light decreases. I cannot give a scientific explanation of this; but several cases have come under my notice where tests have been made, which showed that lamps were not giving much more than half the amount of light bargained for. The most recent instance in point is the little town of Conshocken, in Pennsylvania. The authorities entered into a five years' contract for a hundred 25-candle power incandescent lamps. Not being satisfied that the contract was being fulfilled, an investigation was made; and it brought out that on one night the average was 12·23, and on another night 15·25 candles.

Despite the recent improvements which have been effected in the lamps and the mode of using the current, there have been miserable failures to maintain a supply. Particularly I would refer to Barnet and Leamington. Possibly the failures there are due to causes which additional outlay might remedy; but such an explanation has not been given. A week or two ago an installation was opened in Bradford, where the Corporation have spent from £20,000 to £25,000. Report speaks favourably of this installation; but it has not yet been established long enough to enable one to come to any conclusion regarding it, whether of a favourable or an unfavourable character. In Leeds, and in several other large provincial towns, preparations are being made to introduce the new illuminant; whilst in London the electric light is being largely used at the West-end. Immense sums of money have been spent in erecting plant and laying down mains to supply the Metropolis. We will wait with interest to see whether these Companies are able to commend themselves to public favour. Even should they prove successful, gas managers need not be downhearted. It is notorious that wherever the electric light has been introduced, and has been fairly maintained, the demand for gas has increased. This may be because the bright light upon the streets causes people to be more liberal in their use of gas when they get home; or it may be that gas companies have now an incentive to push for business in other directions—as, for instance, cooking and heating, and motive power—and that their efforts are being crowned with success. In London the returns of Gas Companies continue to show an increase. The same may be said of Paris. In Berlin, the yearly percentages of increase in the manufacture of gas since 1879-80 have been 1·1, 2·5, 4·0, 3·7, 3·1, 3·4, 4·7, 4·4, 6·39. This greatly increased rate of increase has been attained in face of the fact that in Berlin the number of electric installations grew during these years from 333 to 489; the number of arc lamps, from 1554 to 2249; and the number of glow lamps, from 22,363 to 45,552—that is from about 3·1 to 5·9 per cent. of the whole lighting of Berlin. The localities most brightly lit up by the electric light have had specially large rates of increase in gas consumption; these going up as high as 8·5 and 10·5 per cent. These are encouraging figures; and they bear out my conclusion, that should the electric light find favour in the eyes of a section of the community, its introduction will aid rather than injure our industry.

I now turn from the consideration of one branch of artificial lighting—a branch which, within a decade, has swallowed up millions of money—to another, which has been foisted on the public with much trumpet-blowing and beating of drums. I refer to water gas. Now, gas managers are not the men to decry any movement which has for its object the substitution of gaseous for solid fuel. They are too familiar with the enormous waste which results from the combustion of solid fuel in open grates, to oppose reform. They also know that the products of such combustion not only pollute the atmosphere of our towns, but in some respects render town-life miserable. To fuel gas, everyone must look for the conservation of the stores of coal locked up in the bowels of the earth, and at the same time for the purity of atmosphere which is essential to the health of every human being. But the question presents itself, What sort of gaseous fuel must be used? "There's the rub!" Naturally, as gas men, we say coal gas. But the advocates of water gas, which has recently sprung into prominence in this country, maintain that if reform of the smoke nuisance is to be effectual, water gas must be used; their arguments being founded mainly on the not generally accepted assertion that it is cheaper than coal gas. That a larger yield of gas per ton is obtained by passing steam through incandescent coke than by destructive distillation, goes without saying; and that the water

gas is not so liable to deteriorate as the coal gas through the application of pressure, or because of variations in external temperature, must be admitted. But various objections have been raised to the universal employment of water gas. The principal objections stated (by people who do not take into account mechanical difficulties) is that the gas is highly poisonous, and consequently dangerous to life—its poisonous properties not being made evident before the victim has started on that journey whence no traveller returns. This, however, is an objection which can be easily overcome—that is to say, the gas may be made to smell, and that, too, most villainously, so that, should there be an escape, its presence in the atmosphere makes itself instantly apparent. My principal objection is not to the gas itself, but to the way in which it has been publicly advertised as the panacea for all gas ills and bills. Regarding it, statements have ben submitted to the public of a misleading character; and many members of the community, who, carried away by these rosy-hued statements, invested their capital in this new-fangled undertaking, have had time to repent at leisure. Gas at 4d. per 1000 cubic feet has charms to woo a coal-gas ridden public. Why should they continue to pay 2s. 6d. and 3s. per 1000 cubic feet for coal gas when water gas can be supplied for 4d. per 1000 cubic feet? Such is the inconsiderate way in which many users of coal gas argue.

For metallurgical purposes water gas may be advantageously used; and in this field it may be largely employed in the future. But even here its supremacy is disputed by the advocates of producer gas. I will not enter into the respective merits or demerits of these gases; it would be foreign to the object I have in view. I want to say, however, that water gas cannot be sold to the public for domestic purposes at rates much below, if below, those now charged in many towns for coal gas; and consequently there will be no inducement to the public generally to encourage water-gas companies. If the public are content to use magnesia or other metallic combs with a low-quality gas, we are in a position to serve them; but before the public demand gas of low illuminating power, in order to have cheap heating and cooking fuel, I trust they will consider the question in all its bearings. Should they do this, water gas will be relegated to iron and steel factories, where its employment may result in economy of fuel and the production of better goods. Here I may mention that we have recently heard of a process whose birthplace is America, and from which great things are anticipated. This is the Loomis process. The inventor reverses the usual mode of admitting air at the bottom of the furnace. By means of an exhauster he sucks air, and afterwards steam, through the incandescent mass. The first products are producer gas, which may be used in gas-works to heat the retorts; then, as I understand it, ordinary coal gas is obtained; and afterwards steam is passed through the mass and water gas is produced. This latter gas is mixed with the coal gas and sent out to customers. It is claimed for this system that the tar is nearly all converted into gas; that the final product contains a much smaller percentage of carbonic oxide than ordinary water gas; and that it has a high thermal value. I understand that the process is shortly to be tried by a firm in Sheffield; and we shall all be glad to learn further about the experiment.

Upon the future of water gas and coal gas, I will not prophesy; but I have for some time thought that the day may arrive when gas companies and corporations may have to face the question whether it will not be a wise policy to reduce the quality of gas, and sell it at considerably lower rates than now prevail, and thus secure a large day as well as night consumption. I know that this will involve many mechanical changes; but if the necessities of the times urgently demand these changes, then suppliers must adapt themselves to the altered circumstances. Many of us here to-day have seen cherished ideas concerning the manufacture of gas and the economies of its distribution rudely upset; and if we are to have a revolution in gas supply—whether for lighting, heating, cooking, or for motive power—let us be prepared for the altered state of things, so that we may continue to manage the works committed to our care with that degree of success which has rewarded our past endeavours.

I now pass to the third subject which I indicated in my opening remarks—namely, that of oil. Of the three competitors of coal gas in the field, this is perhaps the most insidious. It drains gas companies of customers one by one; and once they have come under the influence of oil, it is no easy matter to get them to return to the gas-fold. The reason why so many people use oil is apparent. They are not called upon to pay for the laying of service-pipes; they are not required to pay for gas-fittings; it is not necessary that they should pay meter-rents; and, lastly, they are not compelled to deposit a certain sum with the treasurer of a company or a corporation before they are allowed to get, not a luxury, but one of the necessities of modern civilization. An oil-lamp to suit all tastes, from the tenpenny life destroyer to the æsthetic model suited to the drawing-room of the successful tradesman, may now be had in every town in the United Kingdom; and oil can be obtained to fill and replenish these lamps at an almost nominal sum. By using oil, the householder is free from all the harassing restraints imposed by gas companies in olden times. They may follow their own sweet wills in the number of lights they shall have; and they may regulate the size of those lights by the quantity of oil they may be able to purchase. Now, having a knowledge of these facts, is it not suicidal policy for a company to refuse a supply of gas because a would-be customer will not pay a few shillings for a service-pipe? This would-be customer argues that he may remove to another town, or another part of the same town; and that, therefore, to pay for a service is just to give so much money to his successor. A gas company cannot argue in this way. When a service has been laid, it is laid for all time—for present as well as for future occupants of the house; and the service being there, the chances are all in favour of the assumption that the new tenant will use the gas supply. Some time ago I took pains to ascertain how much oil came into Doncaster; and, to my astonishment, I learned that the quantity was upwards of 1000 tons annually. I do not know how long this state of affairs may continue, because I may say that within the past twelve months we have in the town given services free and abolished meter-rents. The discontinuance of the meter-rent was equivalent to a reduction of 5d. per 1000 cubic feet to one-sixth of our consumers. Already I begin to appreciate the beneficial effect of these measures, in the increased number of consumers and the increased demand for gas. I am decidedly favourable to the removal of all artificial obstructions to consumption of gas. Manufacturers, whether they be corporations or companies, cannot too soon recognize the fact that they must conduct their business on commercial lines, and not only remove antiquated obstructions, but push for business in the same way as a modern business-house. Mr. Cox, jun., of Sunderland, is to favour us with a paper on "Gas Popularization." I trust the views he will enunciate will help us to see ahead more clearly than we do at present.

We occupy a unique position in Doncaster. We are able to make any sort of gas we like here, and supply it to the public, without infringing the terms of the Act of Parliament under which we work. So long ago as 1827, it was determined to light the streets by means of gas. A Company was then formed; the Mayor and the Corporation buying the greater portion of the shares for the burgesses of Doncaster. A Committee of Management was appointed. The then Mayor, Mr. R. Littlewood, was chosen as Chairman; and ever since the Mayor for the time being, or one of the Aldermen, has been chosen as Chairman. The clause in the Act which entitles us to make and sell any sort of gas runs as follows:—

> That the object of the said undertaking shall be as well the lighting of the streets, lanes, and other public passages and places within and in the vicinity of the town of Doncaster with inflammable air or gas to be produced from oil, coke, coal, or any other substance which the said Mayor, Aldermen, and Capital Burgesses, for the time being, or the major part of them, in Common Council assembled, shall think best, as for supplying such inflammable air or gas for lighting private houses, shops, manufactories, warehouses, or other tenements belonging to private individuals in the said borough and its vicinity.

There is another subject which demands consideration at our hands, as it is now forcing itself upon all communities. I refer to sewer ventilation. I know this subject has engrossed the attention of eminent engineers for some considerable time, and that a large amount of scientific and practical experience has been brought to bear upon it with varying success. I was induced some time since, in conjunction with our Medical Officer, Dr. M. Wilson, and our Borough Surveyor, Mr. Crabtree, to construct and erect a lamp to be fixed in connection with the sewer. The lantern, I may explain, is one of the ordinary high-power type. Instead of being open at the bottom for the supply of air for combustion, it fits tight round an upcast pipe of 6¼ inches diameter. This pipe runs through the centre of the lantern; its upper end being open to the atmosphere, and down through the column to the sewer. The lamp is lighted by six ordinary burners, each burner having a 4 feet per hour regulator; and the atmosphere for combustion is supplied through a series of holes in the upcast pipe at the base of, and inside, the lantern, so that whatever air is needed to maintain combustion comes from the sewer. In the shaft of the column, just above the plinth, a door is fixed for the insertion of the anemometer. From some experiments we have made, we have obtained the following results:—The sectional area of the upcast is 35 square inches; and the velocity of the current induced by the lighted lamps was 16,414 lineal feet per hour, or 3989 cubic feet of sewer gas removed per hour. I am aware that the owners of other systems give figures far in excess of these; but as I have not patented mine, and as I am not running it for trade purposes, I give you the actual results. I saw, some short time ago, in one of the Leeds papers, that the Leeds Corporation were experimenting on the same lines as I have been adopting; and this convinces me that, although I may not have "struck ile," there is "ile" to be struck in this direction. My object in bringing this matter before you is to induce the younger members more especially to give this subject their earnest attention. I may say that the lamp described is now at work, and has been since March last.

The past year has not been prolific of new inventions; and, consequently, I have not many remarks to make. But I cannot let the present opportunity pass without reverting to the very valuable paper read by Mr. Valon, of Ramsgate, before The Gas Institute at its last meeting. Continuous purification in covered vessels has been the dream of engineers for a considerable time; and I consider that Mr. Valon has almost achieved this very desirable object. You are all in possession of his arguments and statistics; and, therefore, there is no necessity to recapitulate them. I may say, however, that I have no doubt those of you who anticipate increasing your purifying area, will very carefully consider the Valon-Brin oxygen process of purification.

Standard sizes for all gas-works stores have often been advocated by this and kindred Associations; and I believe some expression of opinion has been given that our respected Secretary should communicate with other Associations with the view to bring about this

very desirable object. I do not know whether anything has been done; but I do recognize the difficulty we should meet in trying to have one uniform size of retort. It is generally known that there are nearly as many sizes of clay retorts as there are gas managers—each manager thinking his own the best. He may be perfectly right as far as his requirements go, but altogether wrong so far as his neighbour is concerned. Who is to fix this standard? He would be a bold man who would rise and say it shall be so and so. The question, in my opinion, can only be solved by constructive engineers of large practical experience, who are able, from their own observations, to give standard sizes of retorts. We have a gentleman among us who has done good service to this Association, who is ever ready to give us a helping hand, and whose opinion we very much value. He might suggest a standard size of retort. Even if he did, however, I am not sure that it would be adopted by every country manager. It has been argued that we shall obtain our materials cheaper if greater uniformity in sizes prevails; and doubtless there is some truth in such an assumption. But in face of the difficulties of position and situation, I am afraid we shall have to submit to the present state of affairs until "Time's soothing hand" or engineering skill shall have removed difficulties.

Referring to other stores than retorts, I think we have not much to complain of. There was a time, in my own memory, when, for instance, a $\frac{3}{8}$-inch bolt from one firm was quite a different thing from a $\frac{3}{8}$-inch bolt from another firm. Happily, with the name of Whitworth, this anomaly has disappeared. Purchase iron tubes to-day from any firm in the kingdom, and they will follow each other as easily as they would do consecutively from one maker. The same thing applies to cast-iron mains. Even meter unions from several different makers are interchangeable; although some of the meter makers would do well to keep this matter more prominently before them.

I will not occupy your time by discussing the question of large and small ascension pipes, or the various forms of condensers and scrubbers now in use, as these subjects have been thrashed out times innumerable. But I should like to briefly refer to the matter of sulphate of ammonia apparatus. I feel sure we have something more to learn on this very interesting subject. Between the old Coffey still and the Feldmann's process, although there is a wide difference, there is yet much in common. The Feldmann's process appears to be in favour just now. The apparatus at the works of the Doncaster Corporation was locally constructed; and is of small dimensions, but capable of distilling 100 gallons of liquor per hour, and freeing it of ammonia to $\frac{1}{2}$ oz. per gallon. It is easy of manipulation, requires but little attention, and is cheap and sure; and if I were extending I would keep to the same sized still, and increase the number as I would in retorts. I hope some member of this Association will favour us with a paper on this subject at our next spring meeting.

About gasholder construction, I have little to say. This subject has been exercising the minds of engineers for some considerable time. I had the pleasure of seeing in Doncaster last year the model of Mr. Gadd's system. It was first exhibited here to the members of the Manchester District Institution of Gas Engineers. At that time I, in common with other managers present, was much pleased with the originality and simplicity of the design; and with the absence of cumbrous columns and upper guiding. But in looking over the pages of the JOURNAL OF GAS LIGHTING last week, I saw an elaborate illustration of Gadd and Mason's improvements in the construction of gasholders; and I must confess that my ideas of simplicity received, to say the least of it, a shock. My opinion upon this subject may not be worth much; but it appears to me that the difference in cost between the old upper gearing, which has become cheap, strong, and light, and the new arrangement, with its multiplicity of spur-wheels and revolving shafts and spiral gearing, cannot be material, while its simplicity has vanished. I have very vivid recollections of leaving a cosy fireside on cold winter nights to set free one of the late John and James Malam's rack-and-pinion guided gasholders; and I prefer not to renew that experience. When I compare these appliances, I am inclined to ask whether there is anything new under the sun. I bring this matter before you as worthy of thought.

And now, gentlemen, in conclusion, allow me to say how much pleasure I have at seeing so many of my professional brethren in Doncaster. We are all engaged in one common cause—that of supplying gas for artificial lighting, and as fuel, at as low a price as possible. We are, as I have shown you, surrounded by competitors in one important part of the field—namely, that of public and private lighting. I repeat that we have nothing to fear so far as the loss of business is concerned; but there may be a change of venue for the sale of the manufactured article. That, however, is yet a matter for the future to decide. Meanwhile we ought to strive to make gas still more popular than it has ever been; and while we should zealously cultivate that branch of business in which we have so long reigned supreme, we should, octopus-like, spread out our arms and fasten upon every other part of the field where gas is required, whether it be for lighting, for heating, for cooking, or for driving engines. With a fair share of the public patronage in each of these departments, our industry will not only maintain its present powerful position, but will increase in importance and stability.

Mr. T. BOWER (West Hartlepool) proposed a vote of thanks to the President for his address. He said it was not customary for the members of the Association to criticize the presidential address; and he should content himself with moving that their thanks be given to the President for the able and interesting address which he had read to them. Many of the points he had referred to were worthy of consideration and deep thought for the future. Some of them he had himself given attention to; and after the encouragement offered by the President, he should be disposed to think further of them in future. Mr. Bridge had the reputation of being a practical man; and whatever he said was based on the experience of a great number of years. He had given them in his address some of the theory as well as the practice of gas engineering; and they would go away from Doncaster with the feeling that he had done good service to the gas profession generally, and to that of the North of England in particular.

Mr. W. FORD (Stockton-on-Tees) said he had very great pleasure in seconding the vote of thanks. As an old gas man, the President had revived in his mind that morning thoughts which had evaporated long ago. He was especially interested in the reference to sewer ventilation; and if they were permitted to criticize the address, he should have ventured to enlarge upon this point. It should be the aim of gas managers to induce corporations to adopt some system of ventilation by gas. The Borough Surveyor of Stockton-on-Tees, in conjunction with himself (Mr. Ford), had been experimenting in the same direction, though not on the same lines, as the President. The experiments were with Keeling's patent; but whether the arrangements were patented or were, like those of the President, offered freely to the public use, it was desirable that they should endeavour to induce their companies or corporations to experiment in this direction, and so increase the consumption of gas. The employment of the lamps referred to by the President would enormously increase the day consumption, and so tend to minimize the difference between the summer and winter use of gas. His own experience was that 5 feet per hour would be required for each of these lamps; but he was told that the proper consumption for such lamps as the President had put down was 10 feet per hour. If they could manage to get such a constant consumption as this for each of the lamps, there would be a large saving in capital charges and in the average working expenses. Several other hints in the address were worthy of deep consideration; but he would not attempt to enlarge upon them. This was their first visit to Doncaster; and he was convinced that satisfactory results would accrue from the meeting not only to the North of England Association, but to the gas profession generally.

The resolution was carried by acclamation.

The PRESIDENT thanked the mover and seconder of the resolution for their flattering references to himself, and said it had been a real pleasure to him to try to link together the little points in the address. The writing of an address had been, however, a trifle out of his way. He was too much of a practical gas maker to go very deeply into literature; still, if any remarks he had made had conduced to their benefit, he was more than repaid by this fact and by their applause.

GAS POPULARIZATION.

Mr. J. H. COX, jun. (Sunderland), then read his interesting paper dealing with the popularization of gas. This will be found on the opposite page; and a report of the discussion which followed will be given in the JOURNAL next week.

VOTES OF THANKS.

The PRESIDENT proposed a vote of thanks to Mr. Cox for his paper. It was a paper, he said, full of information, and would be the means no doubt of leading them, bearing the diagrams and statements in mind, on the way of increasing the use of gas amongst their consumers. They all tried their best, he presumed, to work on the lines which Mr. Cox had marked out; but his suggestions would doubtless bear fruit in the future. In Doncaster they had tried to popularize gas by letting out cooking-stoves and by buying what they thought to be the best heating-stoves, and supplying them at the lowest possible rates consistent with the interests of the Corporation. Most of the ideas as to ventilation he had tried to carry out, and he found that attention to ventilation made a very great difference, not only as regards the getting of the most heat from the gas, but in satisfying the consumer. He thanked Mr. Cox very heartily in the name of the Association for his contribution to their proceedings.

Mr. T. BOWER moved that the best thanks of the members be given to the Chairman of the Gas Committee and the Mayor of Doncaster not only for the use of the room in which they were assembled, but for the very hearty welcome they had accorded the Association. He could only say that if their President was backed up by gentlemen like Mr. Alderman Wainwright, it was not likely that he would experience many of those difficulties such as he mentioned when speaking before of the way in which the services of gas managers were sometimes regarded. They felt quite sure that Mr. Bridge was supported in a worthy manner; and they were extremely obliged to Alderman Wainwright for being present and for giving them such a hearty welcome.

Mr. W. HARDIE seconded the resolution, remarking that they had been received in a very generous and cordial manner; and he was sure that the visit would long be remembered by everyone present.

The resolution was carried with applause.

Alderman WAINWRIGHT, on behalf of the Mayor and himself, thanked the members very heartily for the resolution. They regarded the visit of the Association as one of very great interest, not only to the Corporation, but to the town generally. He assured them that they fully appreciated the services of their President,

in whom they had a most intelligent and excellent Manager, whose exertions for the success of the undertaking had been very satisfactory. They heartily approved of his services, and were prepared to back him up in the way suggested by one of the speakers.

This concluded the formal proceedings.

Most of the members afterwards visited the locomotive works of the Great Northern Railway Company, through which they were conducted by the Superintendent, and in which they were greatly interested. Dinner was subsequently served at the Angel Hotel; and at its close a short toast list was gone through.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Visit to the Manchester Ship Canal.

Yesterday week, the members of the Manchester District Institution of Gas Engineers held a special meeting, for the purpose of paying a visit to the works of the Manchester Ship Canal Company. The undertaking is exciting very considerable interest throughout the district covered by the Manchester Association; and though the suggestion of the visit was not very heartily taken up when made at Bradford some weeks ago, its popularity was proved by the large number who responded to the Committee's invitation. Altogether between 60 and 70 members and visitors assembled at Lymm, the rendezvous; the majority of them having travelled together by train from Manchester. Luncheon was served at the Plough Hotel; and then the party went forward by train to Latchford—a station in close contiguity to the works. After an inspection of the German navvy—a contrivance after the model of the ordinary river dredger, which is capable of scooping up earth at a speed sufficient to fill 500 railway waggons a day—the party proceeded along the cutting in an easterly direction. On the way they noticed the preparations which are being made to carry the present railway far aloft, by a high embankment, so that it will reach an elevation at which it can pass over the canal. At Latchford there will be situated the first of the series of locks; and the excavations which were going on for these presented many features of interest. The scene was of an animated description. A dozen or so locomotives were running about taking away the soil and rock, worked out by the steam navvies or manual labour, or bringing to the places prepared for them the stone for pitching the side, or the material for concreting. Farther to the east, there were other sights of interest. In several places the contractors have had to temporarily divert the course of the River Mersey, which in this neighbourhood pursues a very devious way, crossing and re-crossing the line marked out for the canal. These diversions are in themselves considerable undertakings; but they are as nothing in comparison with the gigantic business which the construction of the canal involves. A great deal of the work is, as already hinted, being done by labour-saving appliances; but there have nevertheless been employed during the summer something like 20,000 men. During the walk the visitors passed one of the numerous little villages which have been built for the accommodation of these men, as well as a series of mechanics' shops and various offices forming the headquarters of what is known as the Latchford section. The walk of four or five miles proved enjoyable; the whole length of it affording something of interest and instruction. Mr. Arthur Graham, of Lymm, acted as guide, with Mr. James Paterson, of Warrington; and the general arrangements were efficiently carried out by the Honorary Secretary, Mr. S. S. Mellor, of Northwich.

On returning to the Plough Hotel, the party partook of tea. Before separating the President (Mr. T. Banbury Ball, of Rochdale) said he was exceedingly pleased to see so good a muster of members, and to know that the visit to the Ship Canal had proved so popular. He regretted, however, to miss several well-known faces. It invariably happened that some of their members could not attend their meetings; and the bulk of those absent that day were detained in connection with their business. All present, he thought, would agree that they owed a vote of thanks to the Ship Canal Company and the contractor, for according them permission to visit the works. Speaking for himself, the visit had been one of very great interest, and had given him a far better idea of the magnitude of the undertaking which the contractor was prosecuting than could be obtained from a great deal of reading. It was no small feat to have laid out such a colossal work, and to have provided all the necessary plant and superintendence, not to mention keeping the undertaking going at the rate requisite to complete it within the specified time. Quite recently the Chairman of the Ship Canal Company had stated that the work so far had progressed beyond the most sanguine expectations of the Directors; and they saw no reason, either from the obstacles which already had been met with or from the nature of the work which remained to be done, why the undertaking should not be carried to a successful issue. Belonging, as the members of the Institution did, to the Lancashire district, he was sure they all hoped that the expectations of the Directors as to the ultimate success of the canal might be realized to the full. That it would be fraught with immense benefit to the district through which it passed, could not be doubted. However much they might have been disposed, at first, to discount the estimates which were made of the traffic which was likely to pass through the canal, it could not, he thought, fail to attract a vast amount of work to the district. They had been much interested in the portion of the undertaking which they had seen; and he begged to propose that the members of the Institution offer their cordial thanks to the Ship Canal Company—through their Secretary, Mr. J. W. Whitworth—and to the contractor for having permitted them to visit the works that afternoon. Mr. T. O. Paterson, of Birkenhead, in seconding the proposition, remarked that the information the members had gained by their visit to the Canal works would doubtless be of use to them when engaged in operations of a similar—though much smaller—character. They had seen what could be done in the way of excavation; and it had occurred to him that machinery might be brought more into use than it was in the excavation of those large tanks with which they were all familiar. There was no reason why the pick and the spade should be used in that work any more than in this; and he thought they had learnt a lesson which would be of use in the years to come. He hoped that, at no very distant period, arrangements would be made for them to visit the Eastham (Liverpool) end of the canal. Being in the neighbourhood, he should be pleased to do all in his power to make the excursion as successful and interesting as that afternoon's had been. The resolution was heartily carried; and the members shortly afterwards separated.

GAS POPULARIZATION.

By J. H. Cox, jun., of Sunderland.

[A Paper read before the North of England Gas Managers' Association at Doncaster, Oct. 4.]

In bringing this paper before you to-day, it is not my intention to consider the whole question of gas popularization, but to submit for your discussion one or two proposals on our administrative policy with respect to our consumers, together with a few experimental observations in relation to the subject which have come under my own notice.

It has always been the practice among gas companies to direct much attention to devising new processes of manufacture in order to reduce the price of gas. These efforts are praiseworthy and necessary, and might even with advantage be redoubled, though Table I. (p. 697) would seem to prove that mere cheapness of gas does not necessarily mean popularity. I need hardly remind you, however, that there are two ways of cheapening gaslight—one by reducing the price of gas; and the other by increasing the light-duty obtained from the gas by the consumer; and, in fact, cheapening the light. For example, Table II. (p. 697) shows that gas consumers in Sunderland develop, on an average, a light of 11¼ candles from our 16-candle gas. Now, it would be a very difficult thing indeed for us to reduce the price of gas to our average consumer 50 per cent.; but comparatively easy, with his co-operation, to cheapen his light to that extent. Moreover, when we remember that only about 1 per cent. of the energy of burning gas is developed as light, even in the latest and most improved forms of burner, we cannot help feeling that there is at least as great if not a greater field for the chemist and physicist, in the distributing as in the manufacturing department of a gas undertaking.

Many gas companies are at present satisfied if they supply from their works good cheap gas at a fair pressure; leaving the consumer either to convert that gas into light, or dissipate it in heat. Others, again, show that they recognize the policy of extending their moral responsibilities to the consideration of the manner in which their gas is consumed, by adopting one or more of the following methods of popularizing gas:—Holding gas exhibitions and delivering cookery lectures; having show-rooms for stoves and fittings; distributing pamphlets; letting-out for hire or selling stoves, fires, or motors; charging less for gas in large quantities or for heating purposes; charging no meter-rents, and taking no deposits; having a system of short payments; and distributing gas-burners free.

Good as these methods of popularizing gas undoubtedly are, something more is evidently required; for, even in those towns where the gas companies and plumbers are the most zealous in this direction, a walk through the streets or into the shops, or a glance into the hotels, public buildings, or private houses, will give an outsider many examples of how *not* to carry out a lighting installation, and set him moralizing on the amount of light annually lost to the consumer without gain to the gas company.

What the gas consumers of all towns seem to need are *advice* and *inspection*—advice from an engineer who has experimented in gas lighting, and has made himself thoroughly conversant with its principles and with all the improved apparatus for its combustion; and careful inspection of his fittings by an intelligent gas-fitter trained specially for the work. There can be no doubt as to the benefit of this advice and inspection to the gas consumer, and indirectly to the company; but it is a question of cost. Who is to take it up and pay for it? It lies between the consumer and the gas companies. The former, because he does not know the advantages to be derived therefrom, will not move in the matter; therefore, if it is to be done at all, it must be undertaken by the gas companies themselves as a means of cheapening gaslight.

The proposal therefore stands thus: That it is advisable for each gas company to have within itself an organization similar to that of the Boiler Insurance Companies, or the Sanitary Inspection Association conceived by Professor Fleeming Jenkin, for the purpose of experimenting upon new gas-consuming apparatus, encouraging invention, and teaching the science and practice of gas consumption among its staff, the local gas-fitters, and the general public, and in this way cheapening light and popularizing gas for heating, lighting, motive power, and as a ventilating agent among consumers and among people who for various reasons use other illuminants.

As to the constitution of this organization. The distributing engineer (assisted, when necessary, by a small reference committee of directors, who may be considered to represent the interests of the consumer on the board) will be the chief, who will lay down the principles of all reports, and advise upon all doubtful points. But as it is manifestly impossible that he can visit consumers' houses himself, there should be under him one inspecting gas engineer—a young man with the tact and education of a gentleman—to every (say) 5000 consumers, who, working under the direction of his chief, and followed by the inspecting gas-fitter under his orders, will, when welcome, visit the consumer at his house, and, after experiment, report to him, free of charge, on the efficiency of his meter, fittings, burners, cookers, fires, motor, and ventilating arrangements, and where and how they can be improved, together with a rough estimate of the cost of the proposed alterations. If the consumer decides to make the improvements suggested, a specification will be supplied to him which may be carried out by any plumber, or, if preferred, by the gas company in fair competition with the plumber; but, in any case, under the final inspection of the inspecting engineer. As there are but few young men in the country who are specially educated for this work, the companies must train them themselves; and the best apprenticeship they and their workmen can serve is the carrying out of the following proposal, which is an essential part of this scheme for gas popularization.

Besides this system of inspection, each company should fit up, in or near its offices, a series of rooms—some to act as show-rooms for stoves, fittings, &c., and others as laboratories in which to carry out exhaustive experiments on lighting, heating, and ventilating. These rooms, together with the offices, should all the lighted, warmed, and ventilated by gas on different systems, placed under the care of a trained attendant, and opened for the use of the public. The utility of these rooms will commend itself to you. They will be the very training-ground of our staff, and of the local gas-fitters in the practice of gas utilization. Here will be found all the newest forms of apparatus, and the means for scientifically testing them, together with experimental and diagrammatic demonstrations of the principles and the cost of gas lighting. Here the distributing engineer will lecture to his staff, and to the plumbers of the town; and to these rooms the inspecting engineers will bring any consumer who has a doubt about the disinterestedness of their advice.

No particular novelty is claimed for the above proposal, which is simply an endeavour to reduce to a system the spasmodic attempts to satisfy consumers that have been, and are now being, continually made by every gas manager in a field that is far too extended for his unaided labours. Supposing that the initial expense of this scheme is not prohibitive, and that we start with our show-rooms and laboratories, and our system of trained inspection and reports, what a field of useful labour lies before us, and what a mass of valuable statistics these systematic investigations will afford.

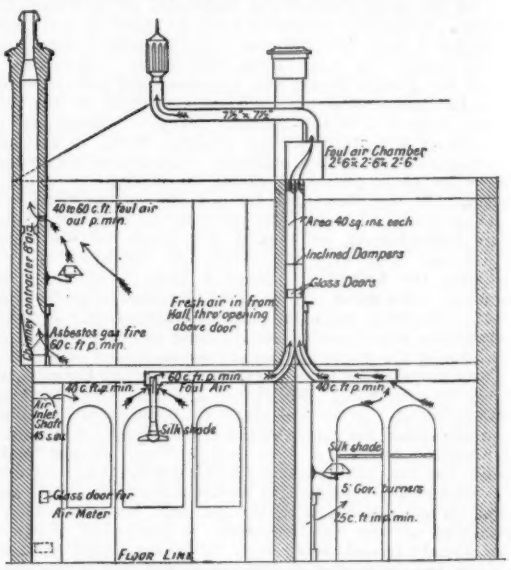
Nearly all gas companies owe their largely increased delivery in the past ten years to the 30 to 50 per cent. more gas used per consumer (due to the desire for more light and to the extended uses of gas) rather than to the yearly increase in the number of consumers, which seems not to be much above 1 per cent., and in many towns is at a standstill. Table I. shows what opportunities there are for inspecting engineers in many towns to overcome local prejudices and difficulties, and push the sale of gas, especially among the working classes, who now pay about 6d. a week for oil, as well as among the upper classes, who can afford to pay for candles at present, and are looking forward to electricity as their illuminant in the future. With regard to the former, some managers of gas companies say that it does not pay to have the working classes on their books; but the table shows that certain very successful gas undertakings must have some very small consumers indeed. With respect to the wealthy consumer, it has been said that, on the grounds of health and artistic appearance, electricity will be the light of the rich; but, as I hope to prove later on, on both these scores the illumination obtained from ventilating recuperative burners suspended singly from the ceiling is the light of luxury.

One sees in the public buildings of several towns gas discarded for the electric light, when, at considerably less capital and maintenance cost, an equally satisfactory system of gas-lighting on improved principles might have been adopted; and all, it would seem, because the owner was not aware what can be done in lighting and ventilating by gas, and had no one to turn to for advice. The inspection of public buildings, and the framing of interior lighting specifications for the free use of architects (as is being now done in Birmingham), might be undertaken as the first duty of our inspecting engineers.

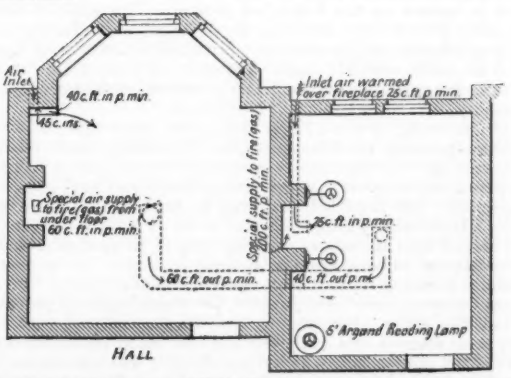
Every endeavour should be made on the part of the inspector to check waste of gas or extravagance in its use; and the idea cannot be too firmly impressed upon the consumer that it is altogether opposed to our interests that anything like waste should go on. That waste of light and heat does exist can be proved to the consumer by the inspecting engineer, by means of diagrams and portable apparatus during his visit, as well as afterwards in the laboratories. Table II., already referred to, proves the importance of using clean, suitable, regulated burners, and illustrates the fact that the quality of gaslight is more dependent upon the burner by which the gas is consumed than upon the care taken in its manufacture.

Gas for cooking and heating purposes is becoming more and more popular every day; and, from information received from most of the large gas companies, it would seem that from 10 to 15 per cent. of all the gas manufactured in this country is used for these purposes. One of these companies estimate that no less than one-half of the gas they sell is consumed in fires and stoves; and though this result may, in a measure, be due to favourable local conditions, yet it is doubtless owing in a much greater degree to the system of advice and inspection carried out by the gas company on matters relating to this branch of their business. For indeed it is quite a noticeable fact that it is in those towns where the hired stoves are well looked after by the company's inspectors that the movement has proved the greatest success.

Gas-fires and heating-stoves require great care in fixing, in order that they may be really economical; the same remark, of course, applies in an equal degree to coal fires. The two evils to be guarded against are waste of gas, owing to excess of pressure; and loss of heat, arising from too great a chimney area. The former may be prevented by having a bye-pass valve and a regulator to each fire; and the latter by contracting the flue, which was originally designed for a coal fire, to from 5 to 7 inches diameter, by means of a damper or "contracter"—an ingenious contrivance invented by Mr. S. S. Robson, of Sunderland—using the excess chimney draught for ventilating purposes, as afterwards described.


7½" x 7½"
Foul air Chamber 2'6" x 2'6" x 2'6"
40 to 60 c. ft. foul air out p. min.
Area 40 sq. ins. each
Inclined Dampers
Gloss Doors
Damper contracter & Q.V.
Fresh air in from Hall thro' opening above door
Asbestos gas fire 60 c. ft. p. min.
40 c. ft. p. min.
60 c. ft. p. min. Foul Air
40 c. ft. p. min.
Air Inlet Shaft 45 s. ins.
Silk shade
Silk shade
Glass door for Air Meter
5' Gor. burners 25 c. ft. per min.
FLOOR LINE

No. 3 (Upper) Room—16 ft. by 15 ft. by 11 ft.; capacity, 2640 cubic feet. Cost of fixing inlet and outlet complete, £1. Consumption of gas for lighting, 5 cubic feet per hour (13 candles). Asbestos gas-fire burns 10 cubic feet per hour. The glass doors shown are for the anemometers.


Air Inlets
40 c. ft. in p. min.
45 c. ins.
Inlet air warmed over fireplace 25 c. ft. p. min.
Special air supply to fire (gas) from under floor 60 c. ft. in p. min.
Special supply to fire (gas) 200 c. ft. p. min.
75 c. ft. in p. min.
60 c. ft. out p. min.
40 c. ft. out p. min.
5' Argand Reading Lamp
HALL

No. 1 (Right-hand) Room—16 ft. by 11 ft. by 12 ft.; capacity, 2112 cubic feet. Consumption of gas for lighting, 15 cubic feet; do. for fire, 15 to 20 cubic feet.

No. 2 (Left-hand) Room—16 ft. by 15 ft. by 12 ft.; capacity, 2880 cubic feet. Cost of fixing lamp and making air channel to vertical foul flue, £2. Consumption of gas for lighting, 11 cubic feet (48 candles); do for fire, 20 cubic feet.

To prove this, some experiments were made upon an open asbestos fire in room No. 1 on the drawing. With the damper full open, 60 per cent. of the heat from the gas went up the chimney. On half-closing the damper, this was reduced to 51 per cent.; and on contracting the flue at the ceiling level to 5 inches diameter, this loss was further brought down to 27 per cent. In each case the heat going up the chimney before lighting the fire was first determined, and then deducted from the amount going away after the fire had been lighted for two hours. The quantity thus obtained was expressed as a percentage of the total heat-units contained in the gas burnt. From the foregoing, it would appear that theoretically there is not such opportunity for improvement in gas heating as in gas lighting; and that recuperative gas-stoves, when the extra cost is taken into consideration, can have but

TABLE I.—*Showing the Number of Consumers in Relation to the Population, the Amount of Gas per Consumer, &c., in certain Towns.*
[Compiled from Published Statistics.]

Reference No. of Town.	Illum. Power of Gas.	Price in 1888.		Candles per Hour for One Penny.	Percentage of the Total Population who are Consumers of Gas.	Annual Consumption of Gas per Hour.
	Candles.		Nett.			Cubic Feet.
No. 1	17½	2s. 3d., 2s. 5d., 2s. 7d., less 5 per cent.*	= 2s. 3½d.	130	12½	61,148
2	20	2s. 3d., 2s. 10d., 3s. 1d. "	= 2s. 7d.	129	16	23,473
3	18½	2s. 3d., less 2½–12½ per cent.	= 2s. 1d.	148	25½	26,288
4	15½	. . . . .	3s. 0d.	86	10½	60,313
5	14½	. . . . .	3s. 1d.	80	10½	51,271
6	16	2s. 2d. to 2s. 4d.	= 2s. 3d.	118	8½	63,388
7	19½	. . . . .	2s. 6d.	130	14	31,607
8	17½	. . . . .	1s. 9d.	167	19½	26,302
9	20	2s., 2s. 9d., less 5 per cent.	= 2s. 3d.	148	16½	27,070
10	16	. . . . .	2s. 0d.	133	10½	44,603
11	18	1s. 10d. less 5 per cent.	= 1s. 9d.	171	21½	26,202
12	17½	. . . . .	2s. 4d.	123	13½	39,304
13	21½	. . . . .	2s. 8d.	134	9	43,970
14	16	2s. 2d. to 2s. 6d.	= 2s. 4d.	114	..	84,330
15	16	. . . . .	2s. 3d.	118	..	79,228
16	20	2s. 8d., less 3d.	= 2s. 5d.	138	15½	37,115
17	16	2s. 6d., less 10–15 per cent.	= 1s. 9d.	145	10	45,266
18	18½	2s. 2d. to 2s. 4d.	= 2s. 3d.	139	14½	33,000
19	20	2s. 3d. to 2s. 6d.	= 2s. 4½d.	140	21	18,420
20	19½	2s. 7d. to 2s. 9d.	= 2s. 8d.	122	23	18,000
21	19½	. . . . .	2s. 9d.	118	9½	27,570
22	18	1s. 10d. to 2s. 2d.	= 2s. 0d.	150	13½	33,181
23	16½	1s. 9d. to 2s. 0d.	= 1s. 10½d.	144	5½	46,674
24	17	2s. 6d., less 20 per cent.	* = 2s. 0d.	142	8	44,604
25	16	1s. 6d., 1s. 7d., 1s. 9d., 1s. 11d.	= 1s. 8½d.	155	8½	45,490
26	16½	. . . . .	2s. 6d.	110	4½	60,870
27	16	2s. 0d., 2s. 1d., 2s. 3d.	= 2s. 1½d.	124	14	26,444
28	17½	. . . . .	2s. 6d.	117	7½	52,017
29	26½	3s. 3d., less 5 per cent.	= 3s. 5½d.	127	19½	11,757
30	28½	3s. 6d., less 1½–5 per cent.	= 3s. 4½d.	141	20	17,000
31	23½	. . . . .	* 2s. 8d.	145	17	18,634
		* No meter-rents charged.				
Averages.	18½	. . . . .	2s. 4½d.	132	13·8 per cent.	39,878

TABLE II.—*Illustrating the Dependence of Gas upon the Burner used for its Consumption, and Comparing the Results with other Illuminants employed under the Best Conditions.*

[The consumption of gas is reduced to 5 feet per hour (the "duty"). The cost in every case (with gas at 1s. 8d. per 1000) is 0·1d. per hour.]

No.	Kind of Burner.	Duty in Candles.
1	Standard Argand	16
2	Sunderland public lamps, consuming nominally 5 cubic feet of gas per hour. . . . . (average)	13½
3	Good batswing, after one year's use (rather dirty)	10
3A	Do. after being cleaned	13½*
4†	Iron batswing	7½
5†	Iron fishtail	8½
6†	Iron batswing	6
7†	Do.	3½
8	Specimen of a wasteful Argand	5½
9†	Peebles' 5-feet regulator burner	14½
10†	Bray's No. 8 flat-flame burner	14
11†	Borrowdaile's governor burner	13½
12†	Sugg's "Christiania" burner	14
13	A good unregulated burner under unnecessary pressure . .	8
13A§	Same burner regulated	12½
14§	No. 1 Argand, at 5 cubic feet per hour	16
14A§	Do., turned down to 3 cubic feet	8‖
15§	Wenham lamp, ground-glass shade, at 45° (in room No. 2). .	22
	Average of the foregoing 18 good and bad burners . . .	11½¶

Illuminants other than Gas, burning under the Best Conditions.

[Results given in candles per hour for 0·1d.]

Electricity.—Incandescent electricity, at ½d. per hour for an 8-candle lamp 3½

Candles.—Palmatine candles, six to the pound, at 10d. per pound, 9 inches long, and burning at the rate of 1 inch per hour—illuminating power corrected to 120 grains per hour, 1½ standard candles 9

Oil.—Petroleum burnt under the best conditions in a 20-candle duplex lamp (oil at 1s. per gallon) 9½

* Here a gain of 33 per cent. of light is shown by cleaning.
† These are specimens of wasteful corroded flat-flame burners, taken from shops in Sunderland.
Specimens of good flat-flame burners.
§ Nos. 13A to 15 give the results of the consumption of gas in low-power burners under varying conditions. The great economy in light effected by regulating the gas supply is shown by No. 13A—an increase of 50 per cent. being recorded.
‖ No. 14A shows a loss of 50 per cent.—the effect of over-oxidation of the flame.
¶ This may be taken as the average amount of light realized by the consumer from 16-candle gas.

little advantage over the simple type, when properly constructed and set. Experiments with the gas-fire in room No. 1 proved that, unless the fire was burning wastefully, only 7 per cent. more of the total heat was abstracted from the fire and gained to the room by recuperation though even this small percentage did good work in warming the incoming air to a comfortable temperature.

In order to determine the relative cost of gas and coal for domestic fires, a series of very careful experiments were undertaken. Best household coal, to the extent of 2·7 lbs. per hour, was burnt in the grate in room No. 1; and enough gas was used in a simple open heating-stove in room No. 2 to maintain an equal average temperature and radiating effect. The result was that 20 cubic feet of gas per hour, costing (at 1s. 8d. per 1000 feet) 0·4d., were found to be equal in effect to 2·7 lbs. of coal, costing (at 13s. 6d. per ton) 0·19d. With regard to waste, ten times as much heat went up the chimney from the coal as from the gas; and had the coal fire had a quick draught instead of being inclined to smoke, this already considerable loss would doubtless have been much greater. Expressed as a percentage of the total heat-units in the two fuels, the waste from coal was 78 per cent., while that from gas was only 26 per cent.

For constant use, gas for fires may be put down as twice as costly as coal. But taking into account the work required for lighting, the dirt, the soot, and the trouble accompanying the latter, together with the ease with which gas can be controlled and saved, and the temperature altered at will, even for constant use gas-fires are not very much more expensive than coal. But leaving these considerations out of the question, supposing that a gas-fire to warm a moderately-sized room *does* cost two-fifths of a penny per hour, what does it amount to? It is not such an expensive luxury even as keeping three candles burning for the same length of time (see Table II.), and would indeed seem cheap enough to encourage every householder to have one, if not in his principle dwelling-rooms, at least in every other apartment of the house.

With regard to the claims of gas as a ventilating agent, I believe that the fact that gas will light and, under certain conditions, at the same time ventilate a room so perfectly that the temperature and percentage of moisture and carbonic acid are the same at the top of the room as at the floor level, is not recognized by the public, nor to its fullest extent even by ourselves. There is an impression that the ventilation of a room is a difficult thing to accomplish; and that moreover it is something incompatible with comfort and warmth. Now, on the contrary, the ventilation of a room is a simple matter when first principles (which it should be our care to teach) are understood; and a well-ventilated room means a regular temperature, no draughts, and an increase of comfort and health without extra cost for fuel.

All rooms, no matter how they are lighted, should be ventilated, in order to get rid of the organic exhalations of the inhabitants, which we recognize as "stuffiness;" and it is a surprising fact to find that even scientific men look forward to a change of light, which they erroneously expect will relieve dwelling-rooms of this evil. In fact, they confound the lesser danger of a tendency to asphyxiation from the inorganic products of the gas-flame in an unventilated apartment, with the greater evil of a chance of poison from the organic exhalations of the living occupants; and seek, at the great expense of a change of light, to remove the former in the future, when at a small cost they might remove them both in the present. We are apt to laugh at the North American Indians who sit in their conical-shaped huts round a fire, with simply a hole in the roof above to serve as a chimney; but truly these savages are not such sinners against natural laws as ourselves. They at least know that hot air ascends, and that its exit must be provided for at the highest point.

Shortly stated, the principles of ventilation are: First, provide a sufficient inlet for fresh air, and warm it as it comes in, either by the heat of the walls of the room (see room No. 2 on the drawing) or by the waste heat of the fire (see room No. 1), or by bringing it in from a warm passage or hall (see room No. 3); in the second place, provide an outlet, without down-draught, at the highest part of the room. Room No. 1 is moderately well ventilated; the warming of the incoming air over the fire being the right thing. But room No. 2 is perfectly ventilated and brilliantly lighted; the absence of excess of moisture, carbonic acid, or

TABLE III.—*Ventilation Experiments carried out in Rooms Nos.* 1, 2, *and* 3.

No. of Room.	Object of Experiment.	Remarks	Outside Air. Temperature. Deg. Fahr.		Inlet Air.		Outlet Air.		Average Room Temperatures at Different Levels in Degrees Fahrenheit.					
									Height above Floor.					Floor Level.
			Dry Bulb.	Wet Bulb.	C. Ft. p. Min.	Temp. Deg. F.	C. Ft. p. Min.	Temp. Deg. F.	10 ft.	8 ft.	6 ft.	4 ft.	2 ft.	
1	To prove the perfect ventilation of room No. 1 afforded by a ventilating recuperative gas-burner consuming 11 cubic feet of gas, 48 candles.	Ventilators closed—no ventilation. Same condition as an ordinary room (60 c. ft. p. min. up chimney.)	41	39	shut	off.	shut	off.	85	78	72	70	69	62 (*a*)
		Opened ventilators, and after one hour.	41	39	50	48	64	40	64	63	64	64	64	62 (*b*)
		Smallest amount of local light—viz. 2 candles, without ventilation (after one hour.)	41	39	..	shut	off.	..	70	68	67	67	64	62 (*c*)
		Lighted gas again and opened ventilators (after one hour).	41	39	48	47	68	107	63	63	63	63	63	63 (*d*)
2	To show air passing through room No. 2.	Chimney:—180 c. ft. at 100° 15 c. ft. gas per hour for fire. 15 „ „ for lighting.	32	..	34	71	56	71	77	76	76	62	61	61
3	To show the efficiency of cheap system of ventilation (£1) in room No. 3.	For 20 consecutive days no down-draught was ever observed from the chimney through the outlet.	42	..	26	54	48	71	68	65	65	63	63	62 (*e*)

REMARKS.

(*a*) Moisture 13 grs. per c. ft. at top of room, 7 grs. at floor level. CO_2 five times as much at top as at floor level. Room felt oppressive below, unbearable above.
(*b*) Moisture 4·3 grs. at top of room, 4·2 grs. at floor level. CO_2 same at top of room as at floor level. Air as pure at top as at bottom of room.
(*c*) Moisture 5 grs. at top of room, 4·3 grs. at floor level.
(*d*) Air had entirely regained its purity; showing *perfect ventilation*. Cost of fixing, lamp, and making air-shaft to chimney, £2.
(*e*) Besides the 48 c. ft. of air drawn from the top of the room, 60 c. ft. went up the chimney. 5 c. ft. of gas for lighting and 10 c. ft. for heating.

Constants used in Ventilation.

Normal air contains 0·364 grs. CO_2 per cubic foot.
Air, in order to be pure, should never contain more than 7 grs. CO_2 per cubic foot.
An adult expires 15 cubic feet of air per hour, containing 4½ per cent. CO_2.
Air at 60° should not contain more than 5 grs. of moisture.

	1 Adult.		1 c. ft. Gas.
Cubic feet of CO_2 per hour given off by	0·7	..	0·5
Heat units given off by	480	..	620
Grains per cubic foot of water vapour	200	..	440
Cubic feet of air actually used by	15	..	60
Do. vitiated in an unventilated apartment	1200	..	500

increased temperature near the ceiling being conducive alike to the vitality of the gas-flame and of the living occupants of the room.

Now, in recommending ventilation among our consumers, we must take care that we do not confound the absolutely essential with what is merely expedient. For instance, the ventilation of these rooms Nos. 1 and 2 is very good; but its accompanying paraphernalia of inlet air-shafts behind the window-casing or over the fire, and separate chimney for foul air, are far too expensive and complicated for adoption in any but a new house.

If we wish the question of ventilation to be taken up by the public at all, it must be by suggesting to them something at once both cheap and fairly efficient. Room No. 3 shows an example of this. The fresh air is brought in from the hall, where the stored-up heat of the walls has already warmed it some 12° above the outside temperature; and the foul air is taken from the top of the room, through an air-brick, into the chimney. This is a very old arrangement, and, indeed, is only going back to the more healthy days of the large fire-place open to the ceiling; but it would seem that its effectiveness is not sufficiently appreciated in these times. For example, the average amount of air removed from room No. 3 (without a fire, but with the grate full open), was 150 cubic feet per minute. The grate was nearly closed, so that the chimney could only draw 60 cubic feet through this channel; the hole shown on the sketch was then made from the room into the chimney; and the balance of air required by the chimney-pot was sucked in at this point, which was exactly the part of the room from which the air ought to be removed. This method can, of course, be adopted with a coal fire, but it is better to have a gas-fire in the grate, because from it there is no smoke, and the grate can be nearly closed—thereby drawing more air from the top of the room, and keeping in the apartment more of the heat from the fire. When adopting this system, care must be taken that the chimney is an effective one. But this is only a matter of experiment.

After an experience of about two years in experimenting on different systems of ventilation, I feel convinced that, for existing dwelling-houses, the ventilation of each room into its own chimney, preferably in conjunction with a gas-fire in the grate, contracting the flue area below that of the chimney-pot, either by partly closing the grate or by fixing therein a "contracter" (see room No. 3), is the system upon which we must experiment, and must advise our consumers to adopt. [The results of ventilation experiments carried out in Rooms Nos. 1, 2, and 3 are given in Table III.]

In conclusion, if we can see our way to taking further steps to prevent waste, and at the same time extend the usefulness of coal gas to the saving and comfort of the public and to the manifest advantage of ourselves, we shall indeed be practising one of those systems of "5 per cent. philanthrophy" which are so dear to the hearts of business Englishmen; and shall we not, moreover, be acting in the true principles of engineering, by making an undoubted "force of Nature more subservient to the uses of mankind?"

SOCIETY OF ENGINEERS.—The last of the vacation visits of this Society for the present year took place on Tuesday, the 1st inst., when the members and associates visited the Deptford station of the London Electric Supply Corporation and the Deptford Foreign Cattle Market. The party numbered about 100, and included the President (Mr. J. R. Baillie), Vice-President (Mr. H. Adams), several Past-Presidents and Members of Council, and the Secretary (Mr. G. A. Pryce-Cuxson). The visitors were received at the electric lighting station by the Assistant-Engineer (Mr. Sparkes) and the Assistant-Secretary (Mr. Baines), in the unavoidable absence of the Earl of Crawford and Mr. Ferranti, the Chairman and the Engineer respectively of the Company. These works were fully described in the JOURNAL for Nov. 6, 1888. The present machinery is capable of producing current for 250,000 incandescent lamps; but the station, when fully equipped, will be equal to serving 2,000,000 lights. After the inspection of the electric light works, in which considerable interest was manifested, the party proceeded to the Foreign Cattle Market, where they were received by the Superintendent (Mr. G. Philcox), by whom they were conducted over the establishment.

TESTING WATER-METERS IN PARIS.—The Water Department of the Paris Municipality has during the past seven years employed water-meters to a large extent. Formerly most of the water was supplied by ganged cocks, which were supposed to furnish a certain fixed quantity of water in 24 hours, which necessitated the use in each house of a supply-tank. Later on a rate was established for the domestic supply of water on what was called the "free cock" system. Now the use of meters is fast extending. Although the preliminary tests were very severe, it was soon found that the different meters soon deteriorated. The cost of removing the meters for additional tests is considerable, besides the trouble to the public and the registrars. To obviate all this, the administration have inaugurated a system for testing the different meters in position. This is done about once in three years, taking a whole section at a time. A small iron tank is used to measure the water. It is set on the sidewalk near a cellar window, through which a delivery-pipe is run from the meter with a special gauge-cock. The tank is cylindrical, with a ball-plug in the bottom, and a gauge either on the outside or an iron rod set in the centre and marked off at every centimetre; and the measured flow is compared with the recorded reading of the meter. If the discrepancy is found to be too great, the meter is removed; otherwise it is left in service till the next round. This test needs two men—one at the meter, and the other at the tank. The whole apparatus is moved about on a hand-cart.

MR. PEASE'S ROPE GUIDING FOR GASHOLDERS.

In another column will be found a description, in general terms, of the system of wire-rope guiding for gasholders invented and patented by Mr. E. Lloyd Pease, of the firm of Ashmore, Benson, Pease, and Co., Limited. As explained in a note to the article, it has been in type for months; having been written some time before any illustrations of the system were available. Instead of re-writing the description, we have thought better to let it stand, as it does not really need correction, as a proof of the information on which our published references to Mr. Pease's invention were based. All difficulties and risks arising out of the patent laws of this and other countries being at an end for the time, we are able to supplement the letterpress description with the appended engravings, showing one modification of this ingenious system. They illustrate a single-lift gasholder guided according to the second modification of Mr. Pease's device, in which the support of the holder is an endless wire rope, free to move horizontally backwards or forwards in the corner guiding pulleys. The goose-necks on the top curb carrying the superior vertical stay-ropes, and the brackets on the bottom curb to which are secured the inferior vertical stay-ropes, will be seen clearly defined in these drawings, and likewise the superposed pairs of rollers by which the direction of movement of these twin ropes is changed from the vertical to the horizontal. It is important to notice that there is no *torsion* member in this system of guiding; all the ropes being only strained longitudinally from the members to which their ends are secured. It will thus be perceived that all the attachments and adjustments are of the simplest and most accessible kind.

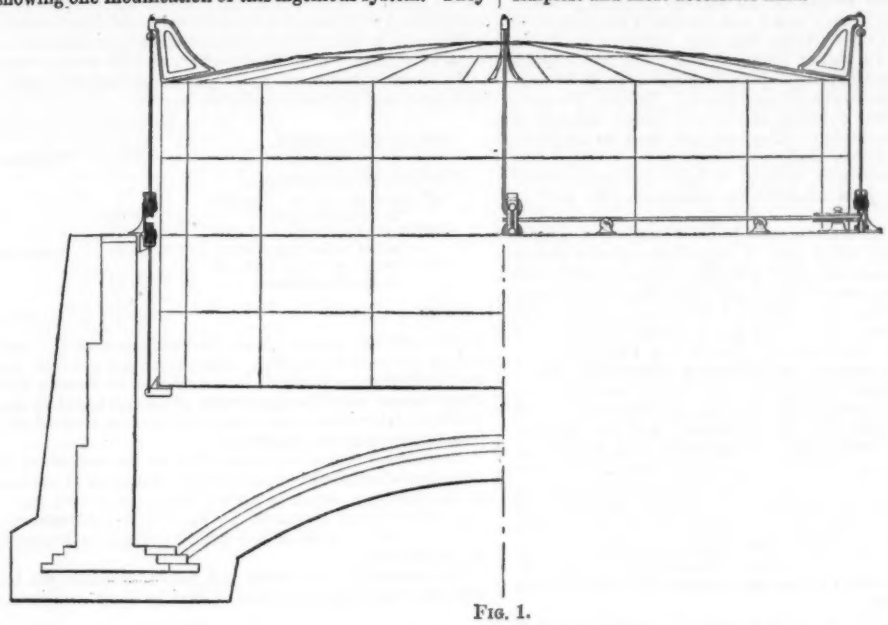


FIG. 1.

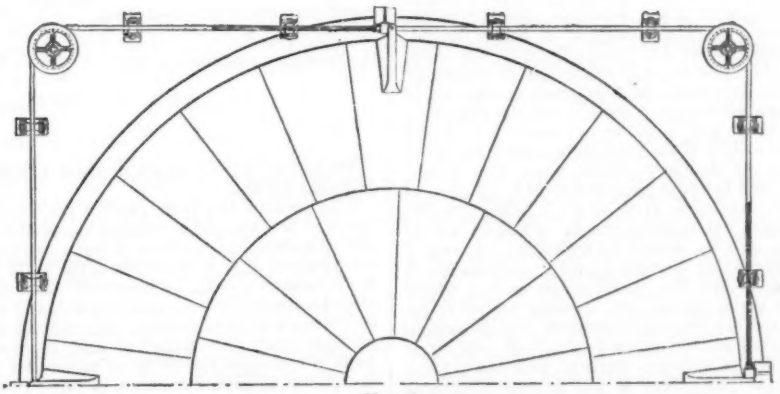


FIG. 2.

GASEOUS FUEL.

By Sir I. LOWTHIAN BELL.

[A Paper read before the Iron and Steel Institute in Paris, Sept. 24.]

For obvious reasons, when power is once generated, the sooner it is applied to the duty it has to perform the better. In like manner, that form of motion known as heat, does its work most economically when the same rule is observed. Of course, it very often happens that a sacrifice has to be made to meet the circumstances of particular cases. A steam-engine of moderate size is often seen storing up its energy in a hydraulic accumulator, in order to transmit it when wanted to a purpose far beyond the power of the prime motor directly applied. Again, in the Siemens furnace 15 to 30 per cent. of the heat of the coal is devoted to converting the coal into the gaseous form, in order that the latter, and the air required for its combustion, may be made to serve as vehicles for returning heat to the work to be performed. This is done because, without this stimulus, the temperature obtained by burning coal in the ordinary way would not suffice for the object in view. In the hydraulic accumulator and in the Siemens furnace, there is a considerable sacrifice; but it is one which, for the reasons given, is quite justifiable.

I have been led to make these introductory remarks in consequence of having been requested by the Council of the Iron and Steel Institute to prepare a paper on a gaseous fuel known as water gas. The compound nature of water was made known by Cavendish and Lavoisier towards the end of last century; and already in 1804 Fourcroy mentions the fact of hydrogen being separated from it by contact with heated charcoal. Eighty-five years afterwards the product of this reaction has been brought largely under public notice; and it is because the natural laws to which I have briefly alluded have been to some extent lost sight of in the recommendations advanced in favour of water gas, that I have complied with the wishes of my colleagues. The present communication will, therefore, contain a reference to some conditions which appear to have been overlooked by those who have been interesting themselves in the question.

The gaseous fuel used in the Siemens furnace is known under the name of "producer gas;" and the manner of its manufacture is too well known to require any description on the present occasion. It varies in composition somewhat, according to the kind of coal employed. For my purpose, it will be assumed in making it that we have to deal with a specimen of coal consisting of 70 per cent. of fixed carbon, 16 of coal gas, and 14 of ash, oxygen, and nitrogen. The producer gas so obtained will consist by weight of 16 parts of coal gas, 163·3 of carbonic oxide, and 222 of nitrogen. Using the Centigrade unit in the calculation, 7200 calories will be taken as the heat equivalent of the coal employed for the gas I am about to examine, and that the latter is received at the regenerators after being cooled. We have then 100 of coal × 7200 calories = 720,000 calories. By the combustion of the producer gas, we have as follows:—

16 of olefiant gas × 10,000 calories . . .	160,000	
163·3 of carbonic oxide × 2400 calories . .	391,920	
		551,920
Difference		168,080

This difference is loss, and represents 23·3 per cent. of the whole.

In a recent publication dealing with the question we are considering, it is stated that "gas as an economical fuel has come among us, and that it has come to stay." In support of this opinion, we are reminded of the immense service which the natural gas in the United States has rendered to industry. Gaseous fuel, however, is not the stranger, at all events to the members of this Institute, which might be inferred from this language. I mention this, after calculating that something like 4000 million cubic feet of gases are daily consumed at the blast-furnaces of Great Britain. As regards the American gas, which I saw in use so long ago as 1876 at Pittsburg, any comparison between it and a factitious gas is, in my judgment, entirely illusory. In Pennsylvania, a mere hole is bored in the ground. This taps the subterranean store, which rushes to the surface under a pressure of 200 to 300 lbs. to the square inch; and the gas is then impelled along a pipe by its own elasticity to the very furnaces at which it is to be consumed. To obtain producer and water gas, a much larger and infinitely more expensive hole or holes have to be dug, and fitted with costly and powerful machinery. Besides the coal, worked at great cost, vast volumes of air and heavy weights of water have to be set in motion. The coal has then to be transported, often for many miles, along a railway, and converted into gaz, mixed with an enormous volume of inert nitrogen, instead of an almost perfectly pure combustible substance like that in America.

It will be convenient here to describe in brief terms the process recommended for making water gas. A capacious cylinder of iron is lined with fire-brick, and provided with the necessary apparatus for introducing the fuel—resembling in principle the cup and cone of our blast-furnaces. The fuel employed is recommended to be in the form of coke, into which, after being lighted, a current of air is forced, until the whole mass is brought to a high temperature. The blast is then stopped, the orifice for charging is closed, and a jet of steam is passed through the now highly incandescent carbon. The steam is decomposed; its oxygen burns the carbon into carbonic oxide, setting free the hydrogen; and the mixture constitutes the so-called water gas. It consists of 1 volume of hydrogen and 1 of carbonic oxide; the weights being in the proportion of 2 to 28, or 1 to 14. A gas of this composition, where an intensely high temperature is required, is for certain purposes very valuable, because, of all substances with which we are acquainted, hydrogen gives out, when burnt, the largest quantity of heat. As an example, while a unit of carbon in forming carbon dioxide affords 8000 calories, one unit of hydrogen generates 34,200 calories in the formation of water.

Now, if by burning a unit of carbon we could generate a unit of hydrogen, the exchange effected in the water gas apparatus might be a very profitable one. Such a condition of things would, however, be directly opposed to the known facts of the case. Chemically, the change in producing this water gas is expressed by $H_2O + C = H_2 + CO$. Now, the heat required to tear away hydrogen from its associated oxygen in water is not less than that which is evolved when these two gases unite; hence $2 \times 34{,}200 = 68{,}400$ calories. The weight of the combining equivalent of the carbon required to effect the change is twelve times that of the two units of hydrogen; and the heat generated by this quantity of carbon being burnt to carbonic oxide is $12 \times 2400 = 28{,}800$. Thus something more than 14½ units by weight of carbon will be required to generate a unit by weight of hydrogen. As only 6 units of carbon are being burnt for this quantity of hydrogen, it will easily be understood that the incandescent carbon which has served to generate water gas is very speedily cooled below the temperature required for the decomposition just described. When this point is arrived at, the steam is shut off, and air is turned on again, in order to obtain a store of heat ready for a further production of water gas. Thus it will be seen the operation consists in alternately making producer gas (which, when using coke, consists of carbonic oxide and nitrogen) and water gas, of the composition to be presently described.

In calculating the amount of heat required to supplement that generated while making the water gas, all we need to know is the quantity of carbon burnt to the condition of producer gas, and that which enters into the composition of water gas. According to the work I have already quoted, 25 per cent. only of the actual carbon used enters into the latter; the other 75 per cent. being converted into producer gas, containing 68 per cent. of inert nitrogen. From 25 parts by weight of carbon, there will be generated 62·50 parts of water gas, containing 4·16 parts of hydrogen and 58·34 parts of carbonic oxide. The producer gas from the remainder (75 parts) of the carbon will weigh 551·19 parts, of which 376·19 parts will be incombustible nitrogen, and 175 parts carbonic oxide.

The following estimate contains the full quantity of heat these two gases are capable of generating by their combustion:—

Water Gas.

4·16 of hydrogen from steam	× 29,400 =	122,304
58·34 of carbonic oxide	× 2,400 =	140,016
		262,320

Producer Gas.

175·00 of carbonic oxide	× 2,400 = . .	420,000
376·19 nitrogen		
551·19	Calories	682,310

Had the 100 parts of carbon been burnt direct, the heat generated would have been 800,000 calories. Hence the loss is 14·68 per cent. Inasmuch, however, as coke was used, and the 100 parts may be taken to represent 150 parts of coal, we have this quantity to multiply by 7200 calories (rather a low product for coal), which gives 1,023,780 calories; bringing up the deficit to 37 per cent.

In employing coke as a material in the gas generator, there is not only the loss of combustible matter which is incurred at the coke-oven, but the labour, &c., in conducting the process of coking. It is obvious, therefore, that if coal is applicable to the purpose, it is in that form that the fuel should be used. I have been fortunate enough to receive an account from a Moravian works containing the particulars of making 6,041,155 cubic metres of water gas, to obtain which 29,734,731 cubic metres of producer gas was generated while heating up the contents of the apparatus in the manner described. It would thus appear that each cubic metre of water gas is accompanied by 4·92 metres of producer gas. The analysis of the coal is not given. On this account, and for the purpose of more exact comparison with what has been already said, I will assume the composition to be that of the specimen already mentioned—viz., 16 per cent. of coal gas, 70 of fixed carbon, and 14 of ash, oxygen, &c.

In a cubic metre of water gas consisting of equal volumes of hydrogen and carbonic oxide, we have—

	Grammes.	
500 litres of hydrogen . . .	= 44·8	
500 „ of carbonic oxide .	= 625·0	= carbon 267·8
Producer gas consists of—		
370 litres of coal gas distilled in heating carbon . .	= 206·83	
1440 litres of carbonic oxide distilled in heating carbon.	= 1,805·19	= carbon 773·6
3110 litres of nitrogen distilled in heating carbon . .	= 3,921·23	
4920	5,933·25	Solid carbon 1041·4

In this the nitrogen is about 63·2 per cent. of the total volume, and 61 per cent. of weight. The carbon in the coal gas amounts to 109·52 grammes, which is considered to remain unchanged in the producer gas. The proportion of carbon burnt in the producers is 2·88 to 1 for water gas, instead of 3 to 1 as allowed in the description, when coke was employed.

From these figures it follows that we are concerned with 1041·4 grammes of solid carbon, and 109·52 grammes of carbon contained in the 370 litres, equal to 206·83 grammes of coal gas. The heat capable of being produced by these two substances is: Carbon, $1041{\cdot}4 \times 8000 = 8{,}331{,}200 + 206{\cdot}83$ coal gas $\times 10{,}000 = 2{,}068{,}800 = 10{,}400{,}000$.

By conversion into water and producer gases, we have to deal with the following quantities of heat by their combustion:—

	Grammes.		
Water gas containing H from steam	44·8	× 29,400 =	1,317,120
„ „ CO	625·0	× 2,400 =	1,500,000
			2,817,120
Producer gas containing coal gas .	206·83	× 10,000 =	2,068,300
„ „ CO . . .	1805·19	× 2,400 =	4,332,456
„ „ N . . .	3921·23		—
			6,401,756
			9,218,876

These two sets of numbers show a loss of 11·36 per cent. in gasifying the coal.

It is perhaps worth comparing the assertion made in general terms in the pamphlet referred to, of the relative proportion of carbon received in the form of water gas and as producer gas. In the equation $H_2O + C$, we have $H_2 + CO$ for water gas; and in the equation $O_2 + C_2$, we have 3 CO for producer gas. The weight of hydrogen in the two equations is 2, and that of carbon 48; or 1 of hydrogen to 24 of carbon. Of oxidized carbon in the example just examined, when using raw coal, there were in the gases 44·80 parts of hydrogen and 23·24 of carbon for 1 of hydrogen. Now, the heat of 24 parts by weight of carbon burnt to carbonic oxide means 57,600 calories which have been expended to obtain 1 part of hydrogen, which when burnt to steam is worth 29,400 calories; the loss being, therefore, nearly 50 per cent. of the heat generated in order to obtain the single unit of hydrogen.

Hitherto I have only spoken of the loss of heat involved by gasifying the fuel before using it; and as the coal is cheaper than coke, we may confine ourselves to that as the material to be used. It is, however, not coal, but gas we have to deal with; and we must consider the cost of conversion. According to the return I have received from Germany, each ton of coal treated cost in its gasification no less than 12s. 2½d., made up by the following items:—Labour, 2s. 11½d.; steam, 3s. 6½d.; fire-bricks and clay, 2½d.; stores, 3¾d.; repairs, 1s.; sundries, 1d.; interest and redemption, 4s. 1½d.—total, 12s. 2½d.

It is not our usual practice in this Institute to deal with purely commercial questions, but the substitution of coke or coal by gaseous fuel is one which scarcely admits of being treated otherwise than as one of cost. In the pamphlet to which I have more than once referred, the expense of converting coke into the two gases is such that it works out, per ton of the coke used, to 1s. 0·84d. for labour, 1s. 5·17d. for interest and depreciation, and 2·17d. for sundries—total, 2s. 8·18d. The labour and other expenses at the Moravian works seem to be very high; and with this observation, I must leave the whole question of cost to be decided by the members themselves.

It is stated that solid fuel, under ordinary circumstances, only gives a useful effect of from 20 to 25 per cent. of the total heat-units capable of being afforded by coal, whereas as high as 90 per cent. can be had from gas; qualified, however, by the statement that it must have a high percentage of combustible gas and a

great calorific intensity. This, of course, must mean the water gas; for the producer gas contains, as we have seen, 63 per cent. of inert nitrogen and very little pure hydrogen. But it must be remembered that this less-important combustible gas represents something like 68 per cent. of the heating power of the two gases, against 32 per cent. contained in the water gas. I am, however, at a loss to understand from where this inference is drawn as to the inefficiency of solid fuel. The raising of steam, and smelting the ores of iron certainly may be included within the category of "ordinary circumstances;" and yet it is no uncommon thing for fuel to evaporate 60 per cent. of its theoretical quantity of water. As regards our blast-furnaces, having regard to the chemical conditions to be observed, 90 per cent. of the full power of the fuel is accounted for by the duty performed.

To account for a supposed inferiority of solid fuel, it is assumed by the author from whom I am quoting that it is imperfectly oxidized. I have to do with a large number of boilers fired with coal; and at the Clarence Works we frequently consume 120 million cubic feet of blast-furnace gas per day. I am prepared to assert that oxidation, in my experience, is as complete with the one kind of fuel as with the other. The quantity of heat evolved by each is, of course, easily ascertained. The only disturbing cause in any comparison is the volume and temperature of the gases resulting from combustion; and here it will be found that the net loss is in favour of water gas, because the exchange of carbonic oxide for hydrogen necessarily reduces the weight of the chimney gases.

I propose now to briefly summarize the results in the following manner:—(1) A specimen of coal, containing 70 per cent. of fixed carbon, 16 per cent. of coal gas, and 14 per cent. of ash, nitrogen, &c., will be examined from a calorific point of view, and its power stated when simply burnt in an ordinary furnace. (2) Producer gas, as supplied to the open-hearth steel furnace, obtained from the same coal, and its heating power also ascertained. (3) The same coal converted into water gas and producer gas by the processes described, and the united power of these two products calculated as before, on the supposition that for one part of the carbon in the water gas 3 parts of the carbon are found in producer gas.

(1) *Coal as Burnt in an Ordinary Furnace.*

	Calories.
100 parts, yielding 7200 calories per unit . . =	720,000
Chimney gases, estimated after making the necessary allowance for oxygen in the coals, 1129 units × 427° C. × 0·24 specific heat . =	115,700

The loss in this case by chimney gases is equal to 16·07 per cent.

(2) *Producer Gas from the Same Coal, as used in Siemens's Furnaces, without the addition of Steam.*

	Calories.
70 of carbon will give 133·33 of carbonic oxide × 2,400 =	391,992
16 of coal gas × 10,000 =	160,000
Sensible heat transmitted to furnace =	62,411
	614,403
Heat in chimney gases, 1129 × 377° × 0·24 specific heat . . . . . =	102,151

Loss by chimney equal to 16·61 per cent.

In the former statement as to producer gas, no note was taken of the sensible heat, because it was wished to compare the heat evolution with the water gas process, where the gases are cooled.

(3) *Water Gas and its Accompanying Producer Gas:—*

	Calories.
Water Gas—17·5 of carbon=carbonic oxide, 40·83×2400 =	97,992
Hydrogen from steam . 2·926×29·400 =	86,024
	184,016
Producer Gas—52·5 of carbon = carbonic oxide, 122·5×2,400	294,000
Coal gas . . . . . 16×10,000	160,000
	454,000
Sum of heating power of water gas and producer gas ..	638,016

Heat in chimney gases assumed of same temperature as ordinary producer gas: 779·7×377° C. × 0·24 specific heat = 70,547 calories = 11·05 per cent.

These figures indicate that for each 100 units of the three kinds of fuel burnt, there is afforded by coal 88·93 units; by producer gas, 71·14 units; by water gas and its producer gas, 78·80 units. Of course, it will be readily understood that these results are not given as effective; but the loss, at the same description of work, being considered identical, the relative value of each is assumed to be as above stated. In cases, however, where an intense temperature is required, in order to do the work in hand quickly, water gas may be highly advantageous. Some years ago I had an opportunity of seeing such an application at Essen in the welding of corrugated boiler tubes; and the work was admirably done.

A very important application is mentioned—viz., for illuminating purposes. For this object the burning water gas—itself destitute of any power in this direction—is made to heat filaments or stems of magnesia. These become so brightly incandescent as to vie, it is alleged, with the electric light! and, in consequence, water gas is largely used in the United States instead of coal gas. I have nothing to guide me in forming any trustworthy idea of the relative quantity of water gas required in comparison with ordinary gas for a given amount of light. In the pamphlet referred to, 9 million tons of coal is given as the yearly consumption among gas-works in this country; and upon one occasion it was mentioned that a volume of coal gas, which would require a 36-inch pipe for its transmission, might in the event of water gas being employed, be conveyed in 1½ inches. If this be true, it means that water gas is at least 810 times as powerful as coal gas, which is probably a mistake.

A good deal of stress is laid on the application of water gas to the manufacture of open-hearth steel. I doubt whether in an operation where a moderate heat, comparatively speaking, suffices, it can be worth while to seek to produce one of a more intense character. At one steel-works with which I am concerned, the ingots were formerly heated in Siemens furnaces. These were abandoned, and ordinary coal-fed fires used in their place; and the saving of fuel effected by the change has been very marked. I should be somewhat surprised if, with longer experience, there will be found any advantage in using the water gas in open-hearth steel furnaces.

It would appear from the figures used for representing the relative values of ordinary producer compared with water gas and its accompanying producer gas, that the sum of the latter gives a better result than the former—viz., 78·80, against 71·14. The difficulty, however, will be, when the richer gas is wanted, to find a market or use for the poorer, which, it must be remembered, represents 71 per cent. of the heating power of the whole. Looking at the question broadly, it seems clear that nothing can be gained, from a calorific point of view, by the proposed gasification of our fuel, and that to the loss in this respect has to be added a very sensible amount by the cost of the operation. This observation has reference to the general application of coal, and to that only. The limit, therefore, will be the circumstances in which a more expensive form of intensely hot fuel-like water gas is wanted, and where doubtless there will be opportunities enough of utilizing the producer gas. For general use, I think solid coal is not likely to be superseded by any factitious gaseous fuel.

Postscript.—Since referring to certain information concerning the manufacture of water gas in Moravia, I have received from my friend, Mr. Paul Kupelwieser, the Director of the establishment at Witkowitz, permission to use his name as my authority for the statements contained in this communication. I find I was in error in supposing that coal had been used in the generators, the fuel employed being small coke valued at 10s. per ton; whereas in a letter to our Secretary it is given at 18s. 5·4d. Coke (from gas-works) is also recommended to English water gas makers; but if ever the day should arrive when, for heating purposes, gaseous has to take the place of solid fuel, and water gas has to displace ordinary coal gas, either raw coal must be employed in the generators, or the great waste of heating power already mentioned in coking the coal must be incurred. Mr. Kupelwieser properly observes the cost of water gas must largely depend on the value which is attached to the producer gas; and he divides the expense in the following manner:—

				Florins.
29,734,731 cub. met. of producer gas at 18 kreutzers per metre .				53,522
6,041,155	,,	,,	673 ,, ,, .	40,653
			Total cost	94,175

Now, the total weight of combustible matter—viz., carbon—in the producer gas is, by calculation, 5898 tons; and its value, based on the price of the cubic metre, is 18s. 1¾d. per ton. The above quantity of water gas is estimated to contain: Carbon, 1619 tons; hydrogen, 270 tons—total, 1889 tons, valued at 43s. per ton. If we take 1000 kilos. as being equal to a ton, the heat from this quantity of carbon, as it exists in the producer gas—viz., as carbonic oxide—may be stated comparatively as representing (1000 × 5600) 5,600,000 calories. This quantity of heat could be obtained by the combustion of 700 kilos. of carbon (700 × 8000 being 5,600,000 calories). It follows, therefore, as a mere question of heat generation that, if 1000 kilos. of carbon in producer gas were worth 18s. 1¾d., this quantity of carbon in its original condition would be worth nearly 26s. The water gas contains in 1000 parts 857 parts of carbon, which multiplied by 5600 equals 4,799,200 calories; and 143 parts of hydrogen, which multiplied by 32,480 equals 4,633,200 calories—together, 9,432,400 calories. To produce this quantity of heat from pure carbon, we should require 9,432,000 ÷ 800 = 1179 kilogrammes of this substance. Thus coke at 36s. 5¾d. per ton would produce heat as cheaply as water gas. These calculations are my own, worked out upon the figures given by Mr. Kupelwieser; and they both tend to show how largely the cost of fuel was increased at Witkowitz by the process of gasification. This gentleman then goes on to observe that, according to his experience, gas obtained from coal in good producers gives perfectly satisfactory results in open-hearth furnaces, and that in nearly all cases such furnaces are worked more economically with producer than with water gas. At the same time he allows that which I previously admitted—viz., that for some purposes water gas may be profitably employed. From another friend I learn that, for each cubic metre of water gas four cubic metres of producer gas have to be made. He would not consider it advisable to convert coal into gaseous fuel for the purpose of raising steam. The producer gas obtained in manufacturing the water gas is used in puddling furnaces and in heating large blocks of metal weighing as much as 50 tons. In the open-hearth steel furnaces, a mixture of the two gases is employed; and for steel intended for castings this mode of treatment is considered very good, because the high temperature afforded by the water gas enables the workmen to have the metal so fluid that it runs with ease into castings, however intricate.

Register of Patents.

GAS LIGHTING APPARATUS.—Sugg, W. T., of Westminster. No. 14,105; Oct. 1, 1888. [8d.]

The object of the present invention (which has several times been referred to in our pages—particularly in the JOURNAL for Oct. 16, 1888, p. 672) is to remove any objection to the use of gas in picture and other art galleries, and in other places where large quantities of gas are likely to be consumed; and it consists in a mode of lighting by gas, whereby the air to support combustion is supplied by artificial means to the lamps which are hermetically sealed to the room or apartment, and the products of combustion are driven or drawn off to a suitable flue.

The system of pipes required comprises a main gas supply-pipe, with which branch gas supply-pipes are in connection; a main air distributing pipe, with branches for each floor of the building; and a main flue or draw-off pipe, with branches for the products of combustion; and each pipe is provided with means to regulate the flow of gas, air, or products of combustion to or from the respective pipes according to requirements. The air supply is produced by pressure or by vacuum—that is to say, the air may be driven along the air-distributing pipes by suitable mechanical means, or it may be drawn in from the external air by producing a vacuum in the draw-off pipes by similar means. The lamps are each connected with the branch-pipes by connections provided with means for regulating the supply of gas and air to the lamp. Any regenerative lamps, or ordinary burners may be employed; but they must be enclosed in a suitable casing (part of which may be of glass), perfectly sealed against the entrance of air from, or the exit of air to the room. This casing is connected with a branch air-pipe, and also with the branch flue before mentioned. The products of combustion are carried off to a suitable outlet, or to a condenser. In the latter case, the flue may be supplied with a water jacket, in which a continuous circulation is kept up; and if the air supply is to be produced by an exhauster, the exhauster will be placed behind the condenser, should one be employed. The air supply will be most conveniently derived from a bellows and receiver, worked (by preference) by a small water motor; but the exhauster to produce the vacuum can be operated in any manner most suitable for the purpose.

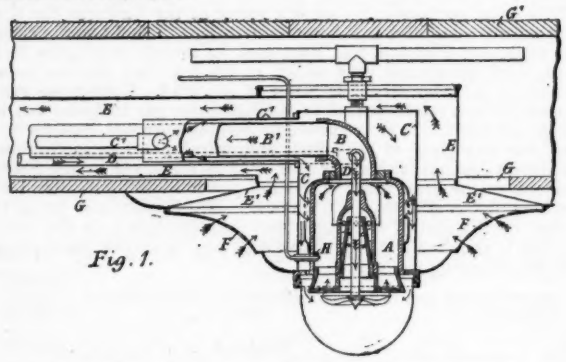


Fig. 1.

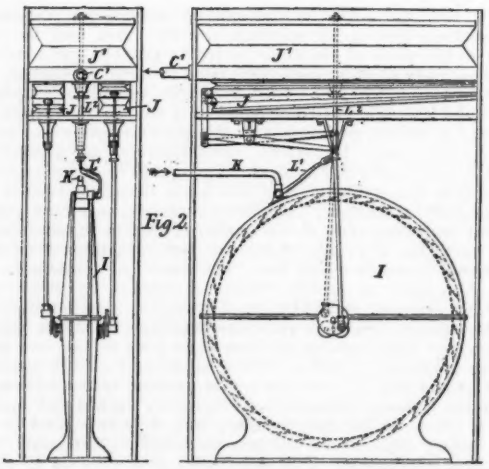


Fig. 2.

In the illustrations, fig. 1 is a sectional elevation of a ventilating lamp and the connections; and fig. 2, front and side elevations of the air-propelling apparatus.

A is the lamp (of the Sugg "Cromartie" type), the chimney B of which is connected to a suitable flue B^1. The body of the lamp is enclosed in a casing C, to which air is supplied by propelling apparatus through the air-pipe C^1; and D is the gas-pipe. This series of pipes is enclosed in an outer casing E, which will also serve as a ventilating flue for the apartment. It is arranged between the joists of the floor; an opening being made in the ceiling to allow the lamp to project through. This opening is covered in by a perforated covering F, in connection with the bell-mouthed end E^1 of the casing. G is the ceiling; and G^1 the floor above. The vitiated air from the apartment takes the direction indicated by the arrows shown in E, E^1, and F. For convenience in lighting the lamp, a flash light H is provided. It is a rotary water motor (see fig. 2), on the axle of which are cranks connected by rods, and an arrangement of levers with bellows J. Above the bellows is a receiver J^1, from which the pipe C^1 conveys air to the series of lamps. Water is supplied to the motor through the pipe K; and at the point L is a cock actuated by the lever L^1 and the rod L^2 attached to the receiver. This cock may be of any suitable construction, but is formed with a nozzle set at an angle of about 40° to the floats of the rotary motor; so that the full force of the impact of the weight of water (whatever it may be) on the floats shall be given.

MANUFACTURING GAS.—Boult, A. J.; communicated from W. G. Wood, of Windsor, Canada. No. 10,256; June 24, 1889. [8d.]

This invention consists in carrying on the process of generating hydrogen gas and of carburetting atmospheric air together in one operation, so that the hydrogen in its nascent state is combined with the carburetted air "to produce a more fixed gas, richer in hydrogen and therefore better adapted to be used for fuel or illuminating purposes than the gas ordinarily produced by carburetting air." The process further consists in the application of electricity "to obtain certain results."

Fig. 1

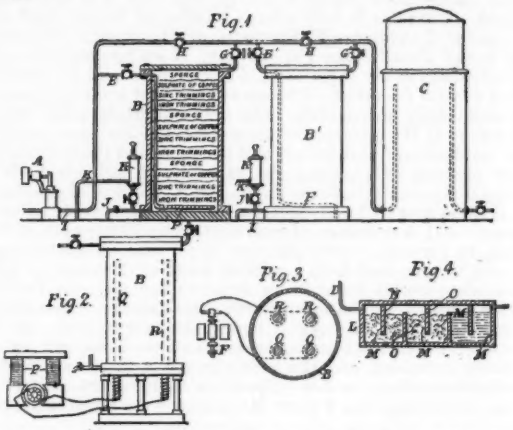


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1 is an elevation (partially in section) showing the general arrangement of plant for producing gas by this process. Fig. 2 is an end elevation showing the generator as modified to apply electricity. Fig. 3 is a horizontal section of fig. 2. Fig. 4 is a vertical central section through the carburetter.

A is an air pump or blower driven by suitable power; B B^1 are the gas generators; and C is a gasholder of any suitable description. A pipe D leads from the pump to the generators, and is connected therewith by branch pipes E E^1, which enter near the top of the generators and extending downwards terminate in a perforated portion F F^1, at or near the bottom. The top of the generator is connected with the pipe D, by means of the branch connections G G^1. Each of these connections is valved; and valves H are placed in the main-pipe D.

The generators are preferably cylindrical in form, with a detachable head or suitable manholes; and they are filled inside with alternate layers of iron filings, zinc turnings, sulphate of copper, and sponge. The sponge before being used is thoroughly freed from all animal matter by washing and drying it; and the sulphate of copper is preferably introduced in the form in which it is placed on the market. Into the bottom of the generator a pipe I enters, which is provided with a waste valve J and a valve connection with a hand pump K or other equivalent device for injecting the liquid charge into the generator.

In practice, the gas is generated in the following manner:—By closing the waste valve J and opening the valve between the pump K and the generator, sulphuric acid of suitable strength is forced into the generator to a certain height above its bottom; the acid being supplied to the pump through the suction-pipe K^1 from a suitable reservoir. Before or after introducing the acid, some crude oil, naphtha, or other suitable liquid hydrocarbon is introduced in the same manner, by the use of the pump K. The connection between the pump and generator being then closed, the valves in the branch-pipes E E^1 and G G^1 are opened, and the valves H closed. The air pump is then set in motion, whereby the air is forced through the pipe E into the generator B, issuing in small jets through the perforated portion F in the pipes. This causes an ebullition of liquid in the generator, and brings the acid into intimate contact with the materials contained in the generator as described. Chemical action will therefore take place between the acid and the zinc and iron, resulting in the generation of hydrogen gas, which mixes with the air and rises to the top of the generator and passes through the pipe G into the pipe D, and from there is conducted to the pipe E^1, into the second generator, in which the same process takes place as in the first generator, and from this the gas finds its way through the pipe G^1 back into the main-pipe D, which conducts it to the holder. At the same time with the production of hydrogen gas, the air introduced by the pump A escapes through the perforated pipe F into the first generator, and there, in addition to causing the mechanical action of ebullition, which assists in the generation of large masses of hydrogen gas, becomes charged with the volatile portions of the liquid hydrocarbon in the generator, and mingling with the hydrogen, passes into the second generator, where it is still further carburetted and finally enters the holder mixed with the hydrogen. In bringing the hydrogen gas in its nascent state—that is to say, at the very instant at which it is generated—in contact with the carburetted air, some hydrogen gas will chemically unite with the hydrocarbon gases and form a mixed gas which in mixing with the carburetted air and uncombined hydrogen is said to form a gas "much superior in heating quality to the ordinary gas obtained from coal or by carburetting air."

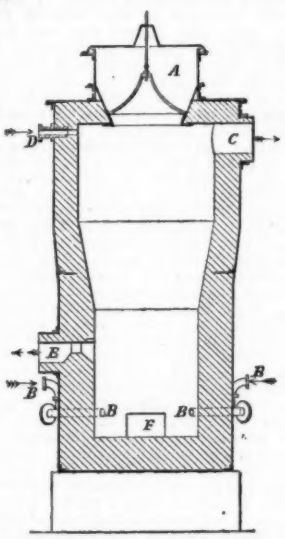
The illuminating quality of the gas obtained depends entirely upon the amount of carburetted air contained in the mixture; and this can be varied to any desired degree, by increasing or decreasing the quantity of air and liquid hydrocarbons introduced into the generator. Should it, however, be desired to make fuel gas and illuminating gas with the same charge in the generator, then it is found preferable to charge the

generators in a suitable manner to produce fuel gas—that is gas with a less quantity of carburetted air—and then pass the gas before storing it in the holder through a carburetting device, such as that shown in fig. 4. This carburetter consists of a box L, divided into a number of compartments M, by means of partitions N and O, which alternately leave a space at the bottom and top. Some of the compartments are filled with charcoal saturated with crude oil or other liquid hydrocarbons; and one or more are reversed for containing water or other washing fluid, such as soap suds. From this carburetter the gas is conducted into a holder in the usual manner.

A further addition to this mode of generating gas is represented in fig. 2, in which P shows a dynamo or other generator of electricity, and Q and R are copper or zinc rods extending through the contents of the generator from top to bottom or nearly so, and projecting out through the base; the generator being supported preferably by columns. These copper and zinc rods are respectively connected with the generator to form the poles thereof, as shown in fig. 3. If the dynamo is set in motion, the rods Q and R become respectively anodes and cathodes; and, provided a suitable current is applied, electrolysis will take place—that is, the metal salts contained in the generator will be reduced just as in the process of electro-plating.

Water-Gas Generators.—Fox, S.; communicated from E. Blass, of Essen, Germany. No. 10,323; June 25, 1889. [6d.]

This invention in water-gas generators consists: Firstly, in blowing into a cupola charged with fuel hot air at a certain level; and in taking out the slag formed during the combustion of the fuel and any flux used therewith, at the bottom of the cupola, in a fluid state after the manner of the removal of such material from a blast-furnace. Secondly, in blowing in steam at the top of the cupola, and taking out the water gas thus formed through an outlet constructed at a higher level than that at which the air is blown in; so that the cooling action of the steam admitted at the top of the fuel should not reach down to the fluid slag at the bottom of the furnace, and to the region where the hot air is blown in.



A sectional elevation is shown of a cupola for the production of water gas according to this invention. In it, A is the hopper through which fuel is introduced; B are hot-air blast-pipes, of which there are a number in proportion to the size of the cupola; and C is the outlet for the "producer gas." D is a pipe through which steam is admitted upon the fuel when it has been brought to an incandescent state; E is the opening through which the water gas passes out of the cupola; and F is an opening (of which there may be a number) through which slag is passed.

APPLICATIONS FOR LETTERS PATENT.

14,929.—Stott, J., "Improvements in or connected, with the construction of sun-burner gas-lamps." Sept. 21.

14,955.—Ashton, D. R., "Improvements in cocks and valves, and to be called the 'Clapton gas-valve.'" Sept. 23.

14,990.—Wigham, J. R., "Improving the illuminating power of light-houses and other places." Sept. 23.

15,106.—Dowie, C. M'K., and Briggs, A. L., "Improvements in apparatus for carburetting illuminating and other gas." Sept. 25.

15,211.—Ashton, J., Wormald, A. H., and Ashton, A., "Improvements in or applicable to the supply of gas or water." Sept. 27.

15,225.—Leoni, S., and Sinclair, J., "Improvements in the construction of gas-burners for cooking and heating purposes." Sept. 27.

15,238.—Firth, S., "Improvements in or relating to means of apparatus employed for opening, closing, and regulating gas and other taps." Sept. 27.

15,300.—O'Connor, H., "Improvements in gasholder guiding apparatus." Sept. 28.

The Price of Gas at Mexborough.—At a meeting of the Mexborough Local Board last Thursday, the Chairman (Mr. Tiptaft) proposed that a deputation wait on the Gas Company with a view to getting the price of gas reduced. He said the charge (3s. 6d. per 1000 cubic feet) was exorbitant, and that it was high time action was taken. At the neighbouring town of Parkgate, the charge was 3s.; and at agricultural places like Driffield and Louth, the charge was less—the consumers at the former place only paying 2s. 10d. At Mexborough the population was 16,000; and at Louth it was only 10,000. The price of gas at Hull was as low as 1s. 9d. The motion was unanimously adopted.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE POLICY OF THE MANCHESTER GAS COMMITTEE.

Sir,—The question of the production of ammoniacal liquor at the Manchester Gas-Works was again before the meeting of the City Council on Wednesday last. I will not say that it was discussed, because it was nothing of the kind. A cloud of words and figures was raised, and the real question was evaded—that is all.

Sir John Harwood was voluble and assertive, and managed to elude the point of his opponents' contention with a dexterity as admirable as it was amusing. His figures, however, which he thought must be "eminently satisfactory," only go to establish the fact that there is a falling off in the yield of ammoniacal liquor in 1888-9, as compared with previous years, and that the revenue of the gas-works has from this source suffered in consequence. It is not any ordinary mind that has the temerity to admit the conclusions of an opponent, in order to prove the correctness of his own. He took care not to commit himself to the assertion that "in years gone by the Committee purchased expensive cannel and poor coal; but now that, having reversed that policy, they were producing less ammoniacal liquor and more gas." That was an absurdity that came more appropriately from the sapient brain of Mr. Alderman Asquith. Sir John knows better than to hazard a ridiculous statement of that kind. His policy is to deal in vague platitudes, and smother the question in a "dust devil" of figures that have no direct bearing on the point at issue, but which are calculated to mislead the unwary.

"The gas is much better in quality than formerly," again ventures Mr. Alderman Asquith, putting his foot in it as usual. He might have added with great relevancy, "and that accounts for the milk in the cocoa-nut." If it is better in quality than formerly, it must have been in a parlous condition of impurity in years gone by; for at the present moment, besides the sulphur it contains, it is heavily charged with ammonia. This latter impurity is the one which, above all the other impurities, can be eliminated from the gas with the utmost ease and facility; and yet it is allowed to pass the gas-works, to be conveyed to the consumers' burners.

Now, I assert that it is this defective purification which accounts for the reduced production of ammoniacal liquor. Even in former years when the results were better than now, 26 gallons of liquor per ton of coal and cannel being produced, the purification in this direction was far from being perfect; but to-day it is simply scandalous. Instead of 23 or even 26 gallons of liquor, if the proper measures were taken to arrest the ammonia impurity at the gas-works, there is no reason why the yield should be less than 30 gallons per ton of the cannel and coal at present being used. This is 27 per cent. above the make of the past year; and as the revenue from the ammoniacal liquor for the same period was £16,293, your readers can calculate for themselves what the increase of revenue from that source alone ought to have been—leaving out of question the larger return that would have been secured by working up the liquor into sulphate of ammonia.

Mr. Alderman Lamb, the Chairman of the Gas Committee, has an inquiring mind. That is a hopeful sign. He said he would be glad if it could be shown how they could make £4000 or £5000 a year more than they make at present; and then, raising himself to his full height, he looked round with a self-satisfied air, as much as to say, "The thing cannot be done, gentlemen." The answer is given above; and I will repeat it, in the hope that the Chairman of the Gas Committee may act on the information: *Let him take out the ammonia from the gas at the works, and secure it as liquor, instead of sending it forward to be burned by the consumers.*

The circumstances are such that no private company, with any pretence to management, would tolerate for a month. There is danger, unfortunately, that, in order to establish the false position they have been pleased to take up, and prove what they assert is the present satisfactory working, the Gas Committee, which is dominated by a few fussy and fusty Aldermen, may wilfully neglect to take the measures—simple enough—that are necessary, and which it is incumbent upon them to take, to bring about a better condition of things.

As I have already stated in a previous communication, the field in Manchester for the consumption of gas is so excellent, and the certainty of a handsome profit at present prices is so assured, that neglect in minor, though sufficiently important, details is condoned, which, under less favourable conditions would not be tolerated.

Manchester, Oct. 7, 1889. T. N.

READING AND RECREATION ROOMS FOR GAS WORKMEN.

Sir,—In your last issue you have an excellent article on "Gas Stokers and the Labour Question," in which recreation-rooms are mentioned. I think you will agree with me that, if these were more generally adopted, all concerned would be permanently benefited. Every large and medium-sized gas undertaking requires some place in which the gas makers could learn every detail of the business. From personal experience, I know that in reading and recreation rooms on the works this can be done, if suitable books are provided, and lectures given illustrated with sketches of the apparatus used in gas making. To obtain the best results in any business, special training is necessary. Those engaged in electric lighting have it; so must the gas makers, if we are to successfully compete with our powerful rivals in artificial lighting.

Dover, Oct. 2, 1889. R. Herring.

THE CONSTANT SUPPLY SYSTEM IN THE METROPOLIS.

Sir,—In your last issue, under the heading "Water and Sanitary Affairs," you refer to a passage relating to the above subject which formed part of the address I delivered as President of the Engineering and Architectural Section of the Congress of the Sanitary Institute held at Worcester in the last week of September.

Owing to a postal mischance, the reporters were supplied with uncorrected proofs only of the portion of my address from which the figures were taken which form the subject of your remarks. The actual text of the paragraph in my address relating to constant supply in the Metropolis, as read by me at the meeting, was as follows:—"I should also remark that, whilst 40 years since it was stated to be an impossibility

to give a constant supply on a large scale, now nearly 3¼ out of the 5¼ millions of the inhabitants within the limits of supply of the Metropolitan Water Companies are enjoying the advantages of a supply on that system; whilst in the provincial water-works it is almost universally adopted."

The above figures agree with those which you properly state to be the correct ones, and were based on the latest returns issued by General A. de Courcy Scott.

4, *Storey's Gate, S.W., Oct.* 3, 1889. HENRY J. MARTEN.

A PIPE-BENDING MACHINE.

SIR,—Under the heading of "Notes" in your issue of the 24th ult., you give particulars of a pipe-bending machine, as used for coiling copper, brass, or wrought-iron tubes.

The machine is, as you term it, "a valuable one for plumbers, gas-fitters, &c.;" but we cannot permit our American cousins to claim its invention. So far as we can read from your description, it is the fac-simile of Drake's (Mr. S. Drake, of Huddersfield) tube-bending machine, which was patented in England some years ago—we believe in the year 1883, and two of which machines have been in action at our Turnbridge Works for a considerable time.

We may add that, from working results, we have fully realized the advantages claimed by the would-be inventors for this ingenious machine.

Huddersfield, Oct. 4, 1889. W. C. HOLMES & Co.

Legal Intelligence.

WESTMINSTER COUNTY COURT—THURSDAY, OCT. 3.

(*Before Mr.* FRANCIS BAYLEY.)

RICHARDS *v.* BENNETT.

This was an action brought by Mr. W. Richards to recover from Mr. W. H. Bennett, patent agent, of 22, Great George Street, Westminster, the sum of £10, which he alleged was due to him. The facts of the case, as gathered from the evidence, were as follows:—Some seven years ago, the plaintiff entered into negotiations with the defendant to apply for patents for a water-meter for France and Germany. The patent for the former country was obtained, but that for the latter was refused; and defendant, as the final fee was not paid, returned to the plaintiff £1 10s. Subsequently, plaintiff asked defendant to apply for a patent in America; and it was agreed, defendant affirmed, that the charge for this transaction was to be £20—his usual fee being 20 guineas. Plaintiff paid £17 at the time; and £3 was to be afterwards paid if the application was successful. Plaintiff denied that this was the arrangement; and averred that the £17 was to be the total charge. However, the receipt which defendant gave at the time showed that the £17 was paid "on account." The application for the patent was duly made; but the patent authorities raised certain objections, and said that the meter was not a fit subject for a patent. At the request of defendant, plaintiff had an interview with him, at which they discussed the objections; and plaintiff, according to defendant's evidence, then took away the whole of the papers for the purpose of meeting the objections. Not receiving a communication from plaintiff, Mr. Bennett wrote to him in the following December, pointing out that he had not heard from him respecting the patent. From then until the present claim was made, Mr. Richards had not communicated with him. In his evidence, plaintiff admitted that at the time he entered into the transaction he regarded Mr. Bennett's charge as reasonable; and he made the present claim on the ground that defendant had not been successful in procuring the patent. Asked why he had not made the claim for the £10 before this year, he said that he had forgotten the matter, until he came across the receipt, in looking through his papers in June last. On behalf of defendant, it was shown that he had had to pay his American agents £9 12s. 6d., £3 of which was for the Government fee. Besides this he had to prepare the specification and drawings, carry on the necessary correspondence, &c.; and he considered the balance of the £17 barely recompensed him for this work. One of the witnesses for defendant (Mr. G. Barnett, of Messrs. Haseltine, Lake, and Co.) stated that the charge of his firm for procuring an American patent was £25; and he considered Mr. Bennett's fee was very reasonable.

Mr. G. F. H. COLLINSON appeared for the plaintiff; Dr. C. H. SMITH, Barrister, instructed by Mr. R. Brooks, for the defendant.

His HONOUR, in giving judgment, said it was curious plaintiff had forgotten this transaction until six years had elapsed. The defendant had shown that he had incurred expenditure to the extent of £9 12s. 6d.; besides having had to do all the preliminary work. His verdict would be for defendant with costs.

TAVISTOCK GAS COMPANY.—The annual meeting of this Company was held yesterday week. The report for the year ended June 30 showed that the gross rental from private lights was £2002, or £99 less than last year. There was a net rental of £1717, after deducting discounts for prompt payment. Three large purifiers have been added to the plant, involving, with minor improvements, an extra outlay of £374. The sum of £720, equal to 18s. per share, had been paid to the shareholders during the year; and the Directors recommended an interim dividend of 8s. a share for the current year. The report was adopted.

THE SALFORD GAS FRAUDS.—A public meeting was held at Pendleton ast Wednesday, in support of the movement for a Royal Commission to inquire into the Salford gas frauds. Mr. Evans presided, and remarked that the members of the Salford Town Council might be satisfied with the settlement of the Hunter dispute; but the working men of the borough were determined to resist any attempt to cloak the suspicious circumstances which had come to light. A letter was read from Mr. J. G. Mandley, in which he characterized the "Hunter compact" as not only a betrayal of the interests of the ratepayers, but a degradation of the borough. He referred to his own action with regard to the discovery of the frauds, and to his communications with the Home Secretary on the subject; and observed that, unfortunately, very few of the leading men of the borough had taken up the question, and, as they knew, one man's influence would hardly prevail with the Home Office. "So thoroughly do I feel the degradation of the Council by this compact," added Mr. Mandley, "that I am seeking to be relieved of my office as councillor." A resolution was adopted calling upon the Government to send down a Royal Commission to inquire into the affairs of the Corporation; and a petition, already signed it is said by about 2000 people, received a number of additional signatures.

Miscellaneous News.

COMMERCIAL GAS COMPANY.

The Ordinary General Meeting of this Company was held last Friday, at the Cannon Street Hotel, E.C.—Mr. T. W. RATCLIFF in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the report and statement of accounts—given in the JOURNAL last week—were taken as read.

The CHAIRMAN: My next duty is to move the adoption of the report and accounts. But before doing that I may say that the Directors have very much pleasure in congratulating the meeting upon the results of the working of the past half year. You will find that the revenue exceeded the expenditure by £51,949; and that the sale of gas produced £115,942, against £116,947—showing a deficiency of £1005. That, however, was caused by the reduction in price from 2s. 6d. to 2s. 4d. in the second quarter of the half year. If the price had been maintained or continued at 2s. 6d., instead of being £115,942, the amount would have been £118,827. The loss by the reduction in price was therefore £2885; but that has been covered to the extent of £1880 by the increase in the sale of gas during the past half year. That increase was about 15,500,000 cubic feet, or a little more than 1¼ per cent. Therefore, although there was a deficiency of £2885, the increased sale reduced that sum to £1005. I do not think I need say more with respect to that. The reduction of price has, I dare say, been very much appreciated by the consumers; there seems to have been evidence of that by the extra quantity of gas that has been consumed. The next item in the accounts is the meter-rental, which shows a reduction of £480; the amount received having been £1811, against £2291. This deficiency does not arise from a diminution in the number of meters, but from the fact that the rental of a certain small class of meters has been reduced in order to give greater facilities to small consumers. With respect to stove-rental, there is an increase of £59; the amount having been £463, against £404—that is equal to 15 per cent. We now come to the residuals. Coke has realized £23,858, against £21,768, showing an increase of £2090; breeze realized £483, against £408, making an increase of £75; tar gave us £6629, against £5526, an increase of £1103; and ammonia realized £10,380, against £9819, an addition of £561. The total increase in our receipts from residual products was therefore £3829. I think I need not say anything more with reference to that side of the accounts. We now come to the other side. There you will find that the coals cost us £58,656, against £57,694, or an increase of £964. That is accounted for in two ways—by the increase in the quantity carbonized, and the increase in the cost of the coals. Our supplies were very much delayed in consequence of the strikes in the North; and our coals have therefore cost us a little more. We then come to repairs, which have cost us £11,647, against £9866; being an increase of £1781. That is rather a healthy sign than otherwise, because as time goes on we must provide for wear and tear, and the repairs must be attended to. There is nothing else on that side of the accounts that requires any observations from me; but if any questions are asked I shall be very happy to answer them. The balance of profit is £51,949, against £52,166; so that, on the whole, it is less by £217 than it was in the corresponding period of last year. But you must remember, as I have said, that we reduced the price from 2s. 6d. to 2s. 4d. This profit of £51,949, with the receipts from dividends on our invested funds, is sufficient to pay the proposed dividends, and leave a surplus of £5518 to be carried forward to next half year. With respect to capital, there have been some extensions on this account; the enlargement of the hydraulic coal jetty at Wapping, and extensions effected in the plant at Poplar having cost us £4647. In addition, 1644 yards of mains have been extended and enlarged; 321 additional lamp and private services have been laid; and the extra gas-stoves have been placed in the district—there being now upwards of 2300 stoves on hire. Our stoves do not go quite so fast as in the Chartered or the South Metropolitan Company; but our neighbourhood is altogether different from theirs. However, we have over 2300 stoves on hire, which is a considerable number. The total capital expenditure in the half year has been £5596. That is all I need say on the accounts; but there are one or two general observations I should like to make. Since July 5 there has been a reduction in the coal dues of 9d. out of the 1s. 1d. a ton; but we do not apprehend that we shall get very much benefit from that at present. We think that the 9d. we shall save in that way will be counterbalanced by other things. The market price of coals has gone up considerably, and we do not know what the effect of that will be yet. In August, as most of you know, there was a movement on the part of the *employés* of the various gas companies for higher pay and a diminution in the hours of labour. We were obliged to give considerable concessions to our workmen—the number of hours of labour being reduced from 12 to 8; and they have had an increase of pay also. In granting this, the Directors only followed the course that was adopted by the other two Metropolitan Gas Companies, and of course they felt it necessary that they should make these concessions. We had some little difficulty in August, in consequence of the strike among dock labourers, in getting our coal. For some ten days there was great interruption in the arrival of coal at our various stations; and we were obliged to make an advance in wages to the men employed in working the coals. I am, however, happy to say that we had a very good stock, which tided us over very well, and we were not put to any great difficulty. I do not think it is necessary for me to say anything further. We do not quite know what the effect of the changes I have referred to will be. I now move—"That the report and accounts be received, adopted, and entered on the minutes."

Mr. J. B. GILL seconded the motion.

Mr. G. ENNIS thought that the Directors might be congratulated for having so successfully brought the Company through a very awkward period. The great dock strike they might have thought would especially affect their Company, whereas he did not see that it had injured them at all. He had no doubt that in the firm and resolute but kind hands of their Engineer, the interests of the men in the Company's employ would not suffer. He was glad to see that the stove-rental was increasing at what he thought a very satisfactory rate, considering the nature of the Company's district; but at the same time he thought there was a vast field for further improvement in the same direction. The use of gas for such purposes might be promoted in many ways; but he had no doubt that the matter had not escaped the Directors' attention. If the electric light were to come into general use in the streets, it might tend to solve the problem of equalizing the day and night consumption of gas; and that would be a great safeguard to the Company in supplying gas for cooking rather than for lighting purposes. However, gas lighting was advancing very rapidly; and he knew that great attention was being paid to the question of fittings. There was a vast field before gas engineers in improving the fittings and removing the so-called smoke-producing tendency of gas combustion. Altogether, he wished to compliment the Directors on the satisfactory position of the Company's affairs.

Mr. GEORGE LIVESEY: I had scarcely intended to say anything at the meeting to-day; but a remark was made by the last speaker which, if it goes forth to the public, may be damaging to gas interests. He has hinted at the possibility of gas being superseded for lighting purposes, and at our being relegated to supplying gas for cooking purposes. If that ever happens, I think we may as well shut up shop, for we are not at all likely to live by supplying gas for cooking purposes. I am, however, not inclined to adopt such a view. As far as supplying the street lighting is concerned, to which the last speaker referred, the electric light is nowhere. If any of you are visiting Brighton this autumn, you will see that the sea front exhibits as magnificent a piece of gas lighting as ever I saw in the world, and no electric light can touch it. If you have the arc light, as at Eastbourne, you have a brilliant light, sufficient to blind you at one point, but midway you have almost darkness; whereas the gas at Brighton succeeds in lighting the whole of the sea front uniformly and splendidly. I was very pleased to see that. We feel that gas is able to hold its own against the electric light. The price at which you are selling gas is quite a safeguard to ensure the continued prosperity of the Company. I should like to add a few remarks now as to gas-stoves. In the South Metropolitan Company we have been making an experiment; we have been trying cookery lectures delivered in various halls in our district. We, of course, naturally selected the richer residential part of the district at first—hiring halls in Clapham, Streatham, and such localities; and we engaged competent instructors in cookery for three or four days in the week, lectures being delivered in the afternoon and evening. When, however, we had tried these better parts of our district, we thought we would extend the experiment, and see the result in some of the poorer parts, such as Bermondsey. To our astonishment, we found we had a better demand for cooking-stoves in those places than in the richer parts of our district. We found that in the latter the ladies sent their cooks to take advantage of the lectures, but they had a strong prejudice against the use of gas-stoves for cooking purposes; but in the poorer localities the people came themselves, and saw how admirably the cooking was done by gas-stoves. The result was that an enormous demand arose for stoves in the places where we least expected it; and my brother will agree with me that in the poorer neighbourhood we have done more business than in the richer. There is no doubt that the use of gas-stoves and the development of gas in other directions, will do a great deal to help us on; but by no means let us give up our faith in gas for lighting purposes, because I am quite sure that, taken altogether, there is no light equal to it.

Sir ROBERT RAWLINSON said he agreed with every word that had fallen from Mr. Livesey. Gas proprietors need not despair. An enormous amount of capital was now embarked in trying the electric light on a grand scale, and some of the things it had done had apparently created great credit for the use of the electric light in connection with certain public works. The construction of the Forth Bridge had been carried on night and day by the aid of the electric light. Magnificent lights had been put up, giving almost a brilliant sunlight; but at what expense, comparing one light with another, and with what was termed candle power? He wondered if anyone at that meeting could at all guess what had been the expenditure per man at the Forth Bridge in candle power for the electric light. Did they think it was 10 candles per man, or 50, or 100? It had actually been 700 candles per man. The work had been done on a most extravagant scale. With the electric light they must light up an enormous space, much larger than they could occupy; while with gas the light could be put exactly where it was wanted. That was the condition in which the matter stood. He hoped that the electric light scare would not alarm any holder of gas stock in the London Companies. As long as they had such a man as Mr. Livesey to look after the general interests of gas, he himself would rest contented, and let the other people do their worst.

The CHAIRMAN: With reference to the observations of Sir R. Rawlinson, all I can say is that in this Company we shall do all we can to reduce the price of gas; and we shall endeavour all we can to induce people to use gas-stoves. We are doing our utmost in that direction; and at the present moment there are 40 stoves on order. He then put the motion, which was unanimously adopted. Subsequently he proposed the payment of the dividends recommended—at the rates of 13¾ per cent. per annum on the old stock, and 10¾ per cent. per annum on the new stock, both less income-tax.

The DEPUTY-CHAIRMAN seconded the resolution, which was carried unanimously.

Mr. COLEMAN proposed a vote of thanks to the Chairman, Deputy-Chairman, and Directors, for their able management of the Company's affairs. Nothing had given him greater pleasure than to hear the very judicious way in which the labour question had been dealt with by the Directors. As to the scare among some shareholders in parting with their stock, he asked where, if they were all to dispose of their holdings, were they going to invest the proceeds to return them 5 per cent. So far from selling their stock, they ought, if an advantageous opportunity presented itself, to buy more of it. He was sure that the shareholders had every confidence in the management of the Company.

Mr. ENNIS, in seconding the motion, said that his previous observations were not meant to be in a pessimistic sense, but to show what a further extensive field there was before gas companies. As to the scare, a stagnant market was very bad; and a scare afforded the opportunity of further investment for those who desired to increase their stake.

The resolution was carried unanimously.

The CHAIRMAN: On behalf of myself, the Deputy-Chairman, and the Directors, I thank you very much for the vote which you have just passed in our favour. I can assure you that it is always our constant endeavour to do that which is best in our judgment for the interests of the Company. The observations which are made from time to time at these meetings, are always regarded, and any suggestion that is made is taken into our serious consideration. We shall continue to do what we have done in the past—exert our best influence for the benefit of the shareholders in the Company. Before sitting down, I think we should pass a vote of thanks to the Engineer, the Secretary, and other officers of the Company. It is all very well to think that the Directors do all the work, but I may tell you that the work could not be done without the assistance of the Engineer, the Secretary, and the other officers. They have laboured hard for the benefit of the Company; and I am sure they will continue to do so. I think it is only right and proper that we should acknowledge what they have done for us; and I hope they will continue to perform their duties in an equally satisfactory manner.

The DEPUTY-CHAIRMAN: I have very much pleasure in seconding that resolution. I think the seconding ought to come from this side of the table, because here we know something of the very great anxiety and worry that our Engineer, and indeed all the officials of the Company, have had in the past few months. While we record our thanks to the Secretary, Engineer, Accountant, and others, I think we ought to bear in mind our sub-engineers at our several stations, for they have had their share, from first to last, in the trouble consequent on the labour crisis. I know how admirably they have been supported by Mr. Jones; but at the same time they have had very troublous and hard times to go through, as indeed we all have. Every member of the Board has felt great anxiety week after week at our meetings, hardly knowing what was going to happen; but we have been most admirably supported by all the officers. I therefore second this vote with great pleasure.

Mr. LIVESEY: Including the foremen.

The ENGINEER (Mr. H. E. Jones): Although it is by no means a novel experience to have your thanks and to enjoy them, the vote just passed is perhaps more pleasant on this than on former occasions. I have to thank you on the part of the whole of your staff; and I am very pleased to find that it has been extended, by direct reference, to those whom I may call my lieutenants—down to the foremen, because I am deeply conscious that they have had an anxious time, as you can easily understand, while all this labour agitation has been going on, and when the strike at the docks suspended our coal supplies and caused our ships to lie idle. I would like to mention, as deserving our thanks, Mr. Cross, of Stepney, Mr. Ludbrook, of Poplar, and Mr. Kent, of your Wapping works, and those working with them; and there are others also connected with the collection of your revenue from gas—Mr. Favatt, for example—to whom our thanks are due. I am delighted to know that not only recently, but at all times, they have watched over your interests to the fullest extent. For myself, my task is very much easier when I have such men to assist me. If I might impose on you a comment on some observations that have fallen here, I should be glad to do so. It is not the province of the Engineer to open his mouth on any subject without the approval of the meeting, except to reply to the vote of thanks passed to him; but the reply affords me an opportunity of saying a few words *ad rem* on two of the questions raised. As to the supply of stoves and fittings, for the period this Company has been at work hiring gas-stoves for heating and cooking, they had up to the spring of this year done a larger business per annum or per quarter, as you might like to take it, than the great Gaslight and Coke Company in proportion to its district, and I rather think than the South Metropolitan Company; but these two Companies have this spring realized an enormous advance. As Mr. Gladstone would say, they have had "leaps and bounds" in this direction. I have not been unmindful of this, and have been delighted to see it; but I do not like to see anything of the kind unless I have my share of it. Your Directors have done a great deal to facilitate the consumption of gas by the small consumers. The question of deposits, which has agitated Mr. Ennis before now, is one that has been greatly modified; and the charges incidental to the use of gas for the first time have been reduced and carefully looked into. We have been doing a large business in that way, and we thought that we had done an extraordinarily good business; but this great advance that has taken place in the rest of London has engaged our attention, and we shall endeavour to give you next year a similarly good statement. As to the questions of lighting and fuel, suppose all the lighting were to go away, and we contented ourselves with stoves for heating and cooking purposes, we might make a gas cheaper than what is necessary for lighting. We might make a fuel gas altogether; and I believe we could maintain an existence without any lighting at all. If you think of the enormous amount of fuel required for domestic houses, places of business, and trading purposes in a great district, you will see that if we gave them a gas specially suitable for those purposes we should drive out of the field the solid and more difficult and troublesome kinds of fuel. We might make that so cheap as to enable us to get on without any lighting at all; but I think there is no chance of that. Sir R. Rawlinson has mentioned a fact which I shall never forget—viz., that in the erection of the Forth Bridge it was necessary, in the employment of this vaunted electric light, to expend 700-candle power per man on the operation he was personally engaged upon in this work. That is the most monstrous waste and extravagance I ever heard of. I have no doubt, however, that the statement is perfectly true; and I will give you a simple reason. The diffusion of light is carried on at a diminution—not directly as the distance you are away from the light, but as the square of the distance. That is, if your light is so grand that you want to illuminate four men, if they are four feet away they would only get one-sixteenth part of the light as compared with what a man with a gaslight within a foot of him would get. If you try to carry the light over a long interval, as they do on the Parade at Eastbourne, it is a failure. You have an intense illumination which dazzles you, and, so to say, debauches your eye while you are immediately under it; but when you get in the middle space you are not only in a position of relative darkness, but your eye has suffered so much from the excess of light before that you are unable to see what otherwise you might have seen in the same spot. If you want to light the streets with the cheapest form of electric light, it is of great intensity, and is not at all suitable for the purpose; and I believe all surveyors—including, I think, the Chief Surveyor of this City—are of opinion that you must have the light scattered about, and that you must subdivide it so as to illuminate uniformly and with economy. I have much pleasure, gentlemen, in thanking you for your kind vote.

The SECRETARY also returned thanks, assuring the proprietors that he would continue in the future, as in the past, to do his utmost to promote the welfare of the Company. Dismissing himself, and coming to the officers under him, he stated that they had a most excellent clerical staff, from Mr. Nash, the Accountant, downwards, by whom their interests were well attended to, and who deserved every praise for the zealous manner in which they performed their duties, which were periodically very heavy.

The meeting then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. F. Cotton) read the notice convening the meeting; and it was agreed to take as read the report of the Directors for the six months ending June 30, the chief features of which were given in the JOURNAL last week (p. 647).

The CHAIRMAN said he regretted there had been a falling-off in the receipts during the past six months. This was partly due to the reduction made of 2d. per 1000 cubic feet in the price of gas, not only in Dublin, but all over the suburban districts. The reduction, of course, amounted, in the aggregate, to a considerable sum. It was almost a universal rule that a reduction in the price of gas led to an increase in the consumption. An increase, however, had not taken place on the present occasion. However, he looked forward to the current half year for an improvement in this direction. In regard to residuals, he was glad to say there had been an advance; and that would go to make up in part for the deficiency in the receipts from gas. The demand for coke had increased; and they were disposing of their stock fairly well, so that the quantity on hand would be much less than it used to be. He was also happy to inform the shareholders that breeze was likewise meeting with a sale—a patent having been lately taken out by which that article could be used in heating boilers; and he hoped that they would shortly see a still larger quantity of this material disappear from their stock The receipts

from the sales of tar had also increased; and the arrangements for the supply of it had proceeded satisfactorily, without any hitch. The amount of tar produced was also greater; and this helped to make up for the decrease in respect of gas. As to ammoniacal liquor, for the first time in their accounts a balance of it appeared on hand. The reason for this was that the arrangements with the contractor or had fallen through. He need not go into particulars on the subject; but the Company had commenced to use the liquor in their own establishment, and had put up works for the purpose of converting it into sulphate of ammonia, which would explain a slight extra charge in the capital account. Despite the decrease by the reduction in the price of gas, it must, he said, be satisfactory to the shareholders to know that the Directors had unanimously recommended the same dividends as had hitherto been paid. This no doubt they had been enabled to do by the balance carried forward from the previous six months. Each half year should speak for itself; and he hoped he was not too confident in anticipating that in the next six months there would be such an excess as would enable the dividends to be maintained. Turning to the other side of the account, the Chairman observed that the price of coal remained unchanged; and the contracts continued for two years more. Therefore they were on the right side and perfectly safe—a matter for congratulation; and although possibly they had at former times been apt to make contracts of too long duration, still he thought the shareholders would deem that the present arrangements were satisfactory. As regarded the storeage of coal, they had manufactured less gas than before; while the quantity of coal stored was the same, and this, of course, tended to show increased expenditure. The general expenses of management had also slightly increased for the same reason. One other matter to which he had to call attention was the electric light. The Directors conceived that, under their Acts of Parliament, they had a right to supply this light; and he believed the Board of Trade were of like opinion. However, when they went to Parliament in 1883, the Board of Trade thought it wise to have a provision inserted in the Company's Act that the breaking up of the streets for the purposes of the electric light should be under their supervision, in order to prevent anything being done which might not be safe for the public. When the Company afterwards applied to the Board of Trade to sanction the opening of the streets, they were opposed by the Dublin Corporation. Of course, the Corporation knew their own business best; but the result was that at present the Company were not allowed to break up the streets. The Corporation had applied for a Licence to enable them to supply the electric light; and it would be the duty of the Directors to carefully watch their proceedings so as to take care that no ground was lost by the Company. One other topic was their dispute with the Corporation with regard to the measuring of the gas for the lamps. Owing to various causes, the parties had been unable to bring this question to a satisfactory issue; and at last the Company were forced in self-defence to serve a writ for the amount which they claimed. The case came before the Court of Exchequer; and after some argument on both sides, a rule of Court was made leaving the matter to arbitration. Arbitration was a fair court when they had arbitrators who were properly qualified. The arbitrators had been named; and the matter was now *sub judice*, so that his tongue was tied. However, he was satisfied that the result would be just and satisfactory to the shareholders. He concluded by moving that the report and accounts be adopted, and entered on the minutes.

Mr. Lawler seconded the motion, which was unanimously agreed to.

The Chairman moved that a dividend be declared at the rate of 10½ per cent. on the old, and 7½ per cent. on the new shares.

Mr. Claffey seconded the motion, which was carried.

Professor Hull said that before the proceedings closed, he wished to refer to one or two matters. First, he desired to know whether the Company's contract with the Corporation was a fairly remunerative one; and, secondly, he would ask whether, considering that their income was being reduced, it was possible to make some reduction in the working expenses. He had from time to time looked at the working expenses; and there was one item on which he was inclined to put his finger—viz., "Collectors' commission, £1919 14s. 7d." This seemed a large sum to pay their collectors. He did not know how long the contract with the collectors would continue; but he would suggest that the earliest opportunity should be taken of making some revision in that respect. There was another point on which he was sorry he felt bound to address them, because he had always been a supporter of the Directors. Owing to the lamented deaths of Alderman Winstanley and Mr. D. Drimmie, the Board had appointed two gentlemen to fill their places on the Board. He had not a single word to say personally against either of the gentlemen who had been elected—in fact, in regard to Alderman Kernan, having taken part on a former unhappy occasion, to which he did not wish further to allude, in supporting his removal from the Board, he was very glad to see his return to it, because he always felt that Alderman Kernan was not the culpable party on the occasion to which he referred. He was more sinned against than sinning; and if it was not impertinent to say so, he thought it was a case of "evil communications corrupting good manners." But he was glad to see his return to the Board; and felt sure that he would work heartily with his colleagues for the benefit of the Company. He thought, however, that, where there were two appointments to be made, it would have been more handsome on the part of the Directors to have allowed the shareholders to have had a voice in the matter, excellent as the two gentlemen who had been chosen no doubt were. With respect to the price of gas, he had been surprised to see in one of the daily papers that, notwithstanding the reduction of 2d. per 1000 cubic feet which the Directors had made within the last twelve months, a further reduction was looked for. Considering that there had not been an extension in the demand for gas, he thought it would be most unfair to suppose that any further reduction could, at present or in the near future, be made. It would be recollected that on a previous occasion when he (Professor Hull) brought this question of price before them, he showed that the Company supplied its consumers at lower rates than were charged by the companies in any of the seaport towns in Ireland, with the exception of Belfast. Therefore he hoped that the Board had no immediate intention of reducing the price lower than it was now.

The Chairman said that as far as the price paid for gas by the Corporation was concerned, he was sure he would be excused from answering the question put by Professor Hull, because the matter was now before the arbitrators. As to the item for commission to the collectors, it was misleading; for the reason that it included the two winter quarters of the previous half year. The collectors were not paid for those quarters until after the books were closed. In the account for the next half year, the amount would be much less. The commission allowed to the collectors was 1½ per cent.; and he thought they did their duty with uncommon energy. As to the price of gas, 2d. per 1000 cubic feet having been taken off, and no increase having taken place in the quantity consumed, whether from early closing or any other cause of economy, the Directors must for the present forego the idea of any further reduction. With regard to the vacancies on the Board, when they occurred in the interval between meetings, the usual course was for the Directors to select gentlemen for the office. This course had been followed on the present occasion; but at the meeting of the shareholders next March, three members of the Board would retire, and three others would have to be elected; and the shareholders would then have an opportunity of making a change, if they should think fit.

Professor Hull said the Chairman had very courteously replied to his observations; and he had listened with great satisfaction to his statement. He now moved that the best thanks of the meeting be given to the Chairman and his colleagues for their conduct of the affairs of the Company during the past half year.

Sir George Owens seconded the motion, which was passed unanimously.

The proceedings then terminated.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Proceedings at the Half-Yearly Meeting of the Sheffield United Gaslight Company held last Tuesday, under the chairmanship of Sir Frederick Mappin, Bart., M.P., were of special interest. At the meeting twelve months ago, the Directors and shareholders decided to subscribe for a portrait of their esteemed Law Clerk (Mr. W. Wake); and on this occasion it was formally presented to that gentleman's family. The picture, which was painted by Professor Herkomer, was exhibited in the room, and was greatly admired.

The notice calling the meeting having been read, it was resolved to take as read the Directors' report and the statement of accounts, an epitome of which was given in the Journal for the 17th ult.

The Chairman moved the adoption of the report and accounts; and said he thought the shareholders, as usual, would be satisfied with the position of the business. It had progressed during the past half year in every way to the satisfaction of the Board; and the usual dividend would be paid. The balance-sheet showed a net profit of £37,415. The dividend upon the shares would require £33,250; leaving a balance to be carried to the accounts of the present half year of £4165. The reserve fund, as the shareholders were aware, was largely added to at their last meeting. Their ability to do this was caused by the issue of the new "D" shares of £6 each. They added to reserve at that time £9191; and the fund now stood at the full amount permitted by their Act of Parliament. He indicated at the last meeting that the requirements of the Company necessitated a considerable outlay to efficiently maintain the works, and to change some of the old appliances for those of more modern construction. This had entailed a large expenditure out of revenue during the past half year, which amounted to £6919 more than the corresponding half of 1888. Repairs to, and alterations of the works had cost £4959 more; and the relaying and repairing of mains £832 more. These two items of expenditure had put the works in the state of efficiency that they ought to be in. The extra amount paid for coal was caused by the demand for larger supplies of gas. The other side of the revenue account was favourable as usual. During the half year, they sold £3162 worth of gas more than they did in the corresponding period of 1888. The sales of coke had increased by upwards of £2000; and there was also an increase of £2000 on tar and sulphate of ammonia—the net profit, as he had already stated, being £37,415. Indications of increased demands for gas came almost daily before their officials. At the present time there were 45,652 meters through which the Company supplied gas; this being an increase during the twelve months of 1461. Of this latter number 1415 did not exceed 20 lights, and the remaining 46 varied from 30 lights upwards; some of them reaching 400 lights, and one being for 600 lights. An increased issue of meters from year to year was one of the most favourable features of the Company's operations; and, in his opinion, the value of the undertaking was maintained so long as a continued progress in this direction was shown. If the Directors could succeed in continuing the advance, the Company would be more stable than any other undertaking in the locality. The increased sale of gas during the past twelve months had been considerable. In the latter half of last year the augmented sales represented £7749; and in the past six months, £3162. Thus during the last twelve months they received £10,911 more for gas than they did in the year ending June 30, 1888. The quality of the gas had been well maintained. There had been 985 tests during the half year, the average of which by the Company's standard was 16·08 candles. If tested by the London standard burner, the average would have been 17·58 candles. By their Act, the Company were called upon to supply gas of not less than 16·50 candles by the London standard burner, or of 15 candles by their own test; so that they were giving gas of higher illuminating power than the Act required. At the last meeting he mentioned the probability of the Directors being able to make a further reduction in the price of gas. During the interval the subject had been under consideration; and they considered that the financial position of the Company, and the constantly increasing demand for gas, justified them in holding out the hope that they would be able to make a concession in the price on Jan. 1 next. He had now a very pleasing duty to perform. It was to call their attention to the portrait of their esteemed Law Clerk. All would, he thought, be highly satisfied with it; and it would be what he believed Mr. Wake and his family would always regard as a very valuable acquisition to their treasures. It was quite unnecessary in Mr. Wake's presence for him to say anything on his behalf. Mr. Wake was well known not only to them but to the town generally; and their high appreciation of his advice was shown by the liberal manner in which they responded to the invitation for subscriptions. He thought it was his duty as Chairman of the Company—although the Board had not instructed him to do so—to formally say, on behalf of the shareholders, that they presented Mr. Wake with the portrait of himself now exhibited in the room, and to express the hope that his life would be spared for many years, and that they would long enjoy his valuable advice. The Chairman went on to say he had been in the habit at their meetings of giving consumers of gas some advice. He would repeat that advice. It was not to be afraid of spending a little money in renewing the internal fittings of their houses—it would well repay the outlay. Every year he had the fittings examined and burners renewed throughout his house; and he did not think anyone had better gas illumination than he had. In conclusion, he said that morning the Manager of the Company had received a communication which, if they would allow him, he would read, as it might interest some of their agricultural friends. It was dated Sept. 30, 1889, and was as follows:—"Having a large family of boarders, we grow fruit and vegetables largely for own use, especially potatoes. We used 3 cwt. of sulphate of ammonia (obtained from your works) with 4 cwt. of superphosphate, and 3 cwt. of kainit per acre. Our crops of potatoes are abundant, the tubers large in size, with very few small, almost entirely free from disease and excellent in quality. Our succeeding crops of cabbage, cauliflowers, &c., are doing remarkably well. Shall want another supply of sulphate, &c., next spring." He did not know whether many of those present could profit by the advice given; but if the public could do so, they would, he believed, benefit themselves greatly, and their doing so would not prove disadvantageous to the Sheffield Gas Company.

Mr. H. Hutchinson seconded the motion.

Mr. F. E. Smith said he was a little disappointed to hear the Chairman

say that the Board contemplated at the end of the year reducing the price of gas. His idea was that the charge was low enough, and that anything the Directors could save should go to the reserve fund, and so increase the security of gas as an investment. The public now were being well served. He instanced the case of Barnsley, where the price of gas was frequently reduced, and then, owing to the large increase in the cost of coal, they had to advance the price again, and it had caused a very bitter feeling. It was all right to keep the price down when it was down. He did not wish to set up his judgment against the experience of the Board; but there was such a thing as trying too much to please the public. He did not believe the public would come to them if they could get that abominable electric light to serve them better.

Mr. HANWELL, in reply to an inquiry, said that the price of gas at Hull was 1s. 10d., and a little time ago it was 1s. 9d.

Mr. J. WILSON said the Sheffield streets were shamefully lighted. At Hull the principal streets were illuminated with lamps of four lights in each, three of which were turned off at eleven o'clock, and the fourth left burning.

Mr. SMITH remarked that it was the fault of the Corporation, and not of the Gas Company, that the streets were not better lighted.

The CHAIRMAN, in reply to Mr. Smith said that gentlemen must bear in mind that the reserve fund was full, so that no more could be added to it; and that the Directors had carried forward a balance of £4165 to the present half-year's accounts. Other people should be considered as well as the shareholders. The consumers had equal rights with the shareholders; and the Directors endeavoured to do their duty to both. Mr. Smith said the Barnsley Company had increased the price of gas. Well, the Sheffield Company could not be ruled by what that Company did. As to coal increasing in price, that was possible; but if coal went up in value, the Company reaped some advantage from the increased price of coke. Mr. Hanwell had said that at Hull gas was supplied at 1s. 10d. per 1000 cubic feet. If there was a large consumption at Hull over a small area, as was indicated by the fact that the street-lamps had four lights instead of one, there could not be anything like the outlay in capital account that there was in Sheffield. The capital of the Company had been largely increased by taking gas to Chapeltown, Ecclesfield, and other distant places, where the consumption was not always as much as the Directors would like. The lighting of the streets and roads rested entirely with the Corporation.

The resolution was then unanimously carried.

The CHAIRMAN next moved the declaration of a dividend for the half year of 5 per cent. on the "A," "B," and "C" stocks, of 6s. per share on the "E" shares, and of 1s. 2½d. per share on the "D" shares.

Sir HENRY STEPHENSON seconded the motion, which was unanimously adopted.

The retiring Directors (Sir Frederick Mappin, Mr. H. Hutchinson, and Dr. H. C. Sorby) were re-elected.

Mr. W. WAKE asked to be permitted to offer to the shareholders his very sincere and heartfelt thanks for the great compliment they had paid him in asking him to sit for his portrait to that celebrated artist Professor Herkomer; and for the resolution passed at the last meeting that the portrait, instead of being hung in the Council Room at the Company's offices, should be presented to his wife and family. The compliment paid to him was one for which he was exceedingly grateful; it was one which he could not find words duly to acknowledge. During the period—now close on half a century—that he had held the office of Solicitor and Secretary to the Company, he had uniformly met with the greatest kindness, not merely from the Directors, but from the shareholders at large. Of late years his duties had been of a routine and easy character; but formerly there were many occasions when the attacks made upon the Company caused the Directors and officials—himself amongst the number—no little trouble and anxiety. Perhaps a few facts connected with the supply of gas to Sheffield not known to many present, if to any of them, might be interesting; and as they could be mentioned without the possibility of injury resulting to the Company, he would, with the permission of the meeting, refer to them. The first Gas Act for Sheffield was passed in 1818, with a capital of £40,000. In 1835 a second Act was passed, with a capital of £80,000. There was no price fixed for the gas, and no standard of quality. The Act of 1835 was not obtained until after one of the longest and most severe contests that had ever taken place in the House of Commons or the House of Lords Committees up to that time. He commenced his connection with gas on that occasion, acting as his father's clerk during the whole of that period. Things went on—two Companies competing with each other. Streets were repeatedly broken up; customers were changed day by day; and it was found that, instead of being beneficial, competition in gas was most prejudicial to the public. The result was that in 1844 the two Companies were amalgamated; and the capital of the two concerns was fixed at £135,000. The price of gas was limited to 6s. 8d. per 1000 cubic feet; but there was no standard of quality. In 1852 an extreme party in Sheffield started the proposition that gas could be supplied and streets broken up without any statutory powers. They erected works, and broke up the streets; and this soon led to long proceedings in the Courts of Law (in equity), before Magistrates, and at the Assizes. The result was that the Consumers' Company were compelled in 1854 to apply for an Act of Parliament. Their application was strongly opposed by this Company; and in the end, an arrangement was made for the old Company to buy up the Consumers' Company, at a discount of about 30 per cent. In 1855 an Act was passed confirming this arrangement, and fixing the capital of the Company at £264,984. That Act, he believed, was unique. It provided for the Corporation appointing three nominee Directors, an auditor, and a person to test the gas; and it limited the charges, and also the scale for meters. When the Act was first passed, there was some little friction between the elected Directors and the nominee Directors, but that soon wore away; and of late years the two had acted most amicably together, with great benefit both to the shareholders of the Company and to the consumers. In 1870 the Corporation of Sheffield introduced two Bills. One was to compel the Company to sell their works at arbitration price; and the other was, if that were not done, to enable them to establish new works to compete with the Company. Of course, these Bills were strenuously opposed by the Directors; and he was thankful to say that both Bills were rejected without the Company being called upon to address the Committee, or say one single word on their own behalf. All the necessary facts were brought out by the cross-examination of the promoters' own witnesses. In promoting those two Bills and in connection with the Water Act, the Corporation incurred very considerable expense; and those expenses they could not legitimately pay. In 1871 an Improvement Bill was brought in by the Corporation, which contained, amongst others, a clause authorizing them to pay out of the borough fund the expenses of the three applications; and what was still more serious for the Gas Company, empowering them, whenever they chose, to go to Parliament, at the expense of the borough fund, to oppose any scheme of the Gas and Water Companies. That Bill, of course, was opposed; and after considerable negotiation, the Corporation withdrew the objectionable clauses, and the Act was passed without them. In 1872 an Act, called the Borough Funds Act, was brought in; and that would have had the same effect as far as the future went as the Improvement Bill of the Corporation. That Bill the Gas Company opposed, and succeeded in getting so modified that the Corporation could not make application without the consent of the ratepayers. Alluding to the limits of the old Companies and the new, he said the present authorized capital of the Company was £792,411; and their annual dividend was 50 per cent. more than the entire capital of the Company in 1881. It was nearly equal to the capital of the Company in 1835; and it was almost equal to half the capital of the united Companies in 1844. In conclusion, Mr. Wake said he wished to tender his sincere thanks for the compliment the Directors and shareholders had paid him; and also wished to thank their excellent General Manager (Mr. Hanbury Thomas), for the great trouble he had taken with reference to the portrait, and for the unvarying kindness he had always received from him, when the duties of their respective offices had brought them together.

A vote of thanks having been passed to the Chairman and Directors, the proceedings terminated.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held at Harrow yesterday week—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY and ENGINEER (Mr. J. L. Chapman) read the notice calling the meeting; and it was then agreed to take as read the Directors' report and accounts for the six months ending June 30 last, a reference to which appeared in our issue for the 17th ult. (p. 565).

The CHAIRMAN, in moving the adoption of the report, called attention to the first paragraph, which stated that the price of gas since the commencement of last year had been reduced 6d. per 1000 cubic feet. This, he said, represented something like £750 a year, or about £175 a quarter. They might fairly have expected a very considerable reduction in the gas-rental; but the quantity of gas sold in the past half year was 576,000 cubic feet more than in the corresponding half of last year. Taking into consideration the reduction, the loss was £31. The gas and meter rental for the six months amounted to £3424; whilst in the corresponding period last year, it was £3454. This was exceedingly satisfactory; and there was a prospect of their normal revenue being reached. The residual products showed better results; coke exhibited an increase of £61 compared with the corresponding half of last year. Tar was £27 more; and sulphate had improved by £13. Viewing both aspects of their business, he thought they were very good. Altogether the Company was in a better position than he had known it for some time. Since last year 9d. had been taken off the duties on coal; and a further reduction of 4d. would be made in the near future. This, he hoped, would go a long way towards meeting the increased price of coals, which they must be prepared to pay. The works were in good condition. The pipes had recently been overhauled, with the result of lessening the leakage; and, speaking generally, matters looked very promising for the Company.

Mr. JOHN CHAPMAN, in seconding the motion, referred to the prospect of having a railway station near the works, and said it would be a good thing for the Company in connection with the coal supply.

The resolution was carried.

Dividends were next declared, as follows:—7½ per cent. on the original "A" capital; 7 per cent. on the additional "B" capital; and 5¼ per cent. on the additional "C" capital.

Mr. C. HORSLEY then proposed a vote of thanks to the Engineer; and in doing so, spoke of the satisfactory work that he had done. Taking the mileage of mains into consideration, the leakage in the Company's district compared favourably with that of any company round London. He would also include in the vote the officers generally.

Mr. A. H. BAYNES, in seconding the proposition, said he should like to bear his testimony to the personal interest their Engineer took in the affairs of the Company. It was no mere formal service, but an intelligent interest in the progress of the concern. He proceeded to say that the Directors were joint trustees for the shareholders and consumers, and were anxious to study the pockets of both. He thought the policy of the Board in reducing the price of gas persistently, and maintaining the dividend at the present rate, was one that should commend itself to the consumers.

The motion was unanimously agreed to.

The SECRETARY and ENGINEER, in responding, said he was very pleased with the position the Company were in that day. The consumers were satisfied, and had helped the Directors to keep the price down by burning more gas. Higher dividends might have been paid; but the policy of the Board was to meet the consumers before paying any extra dividends. It had been a great pleasure to him to think that, with a reduction in the price of gas, they still had a good balance-sheet; and he hoped the same state of things would attend the future working of the Company.

A vote of thanks was passed to the Chairman and Directors; and the proceedings then terminated.

FLEETWOOD GAS COMPANY.—At a meeting of this Company last Saturday week, it was resolved to pay a dividend of 5 per cent. out of the profits which have been made during the last three years, it being three years since the last dividend was paid. It was further decided to allow a discount of 2½ per cent. to all consumers of gas who pay their accounts within 21 days after demand, as well as 7½ per cent. on all gas used for cooking purposes.

THE NORTHERN COAL TRADE.—The coal trade in the North is now dividing itself into two distinct positions. Northumbrian coal is growing worse with the falling off in the inquiry from the North; whilst the Durham coal trade is reaping the benefit of the rising demand for gas as well as for manufacturing coal. For the steam coal of Northumberland there is a decidedly weaker demand; and prices are a little lower. Best qualities are now quoted at 9s. 6d. per ton, and second classes from 6d. to 9d. lower; some of the pits which produce the latter now working short time. Gas coal, on the other hand, is in brisker demand; and it is evident that gas companies are using more, and are laying in stock. For best gas coals from 9s. 6d. to 10s. per ton is now asked; and some heavy contracts for export to Genoa are believed to have been concluded. Manufacturing coal is being contracted for for next year, and very high prices are asked. Coal which was sold for this year at 4s. 6d., is for next year sold now at from 6s. 9d. to 7s. per ton. It is quite probable that the high prices at present demanded will be reduced before the larger contracts are fixed; but, on the other hand, it is equally certain that very considerable advances on the rates now being paid will be needful to ensure coal for next year. As far as some of the gas companies are concerned, the higher price obtainable for coke will in part counterbalance the loss. Gas coke, which was sold a little more than a year ago at about 7s. per ton, and which is being delivered at that price, could be readily sold for export from the Tyne at 11s. 6d.; and it may be that next year a higher figure will rule.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Assembly of this Company was held on the 1st inst., at the Company's Office, St. Helen's Place, E.C.—Mr. A. W. GADESDEN in the chair.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and the Directors' report and the statement of accounts (which were summarized in the JOURNAL last week) were taken as read.

The CHAIRMAN: Gentlemen, I think I may congratulate the shareholders upon the fact of our being able to maintain the 7½ per cent. dividend, without in any way seriously interfering with the reserve fund. As will be seen by the printed accounts, the revenue shows a satisfactory increase; and if the state of trade remains as prosperous as it is at the present moment, there is no reason to doubt that this increase will continue. The accounts really present no point of interest that requires any explanation from me; but if any gentleman wishes for further particulars with reference to them, I shall be very pleased indeed to supply the necessary information. Now, it may be interesting to the proprietors that I should say a few words with respect to the two great works the Company are at present carrying out. The one has reference to the removal of the principal pumping station from Old Ford to Lea Bridge, and the other to our sinking wells in the Lea Valley. With regard to the removal of our works, I am pleased to report that owing to the indomitable energy of our Engineer (Mr. W. B. Bryan), the works are in a very forward condition. They comprise the building of a new engine-house and boiler-house, and also the placing of a new 42-inch main, to convey the water pumped from the new pumping station at Lea Bridge to our distributing system at Old Ford. Well, now, with respect to the engine and boiler-houses, it may be interesting just to state, so as to give some idea of the magnitude of the engine-house, that, when the three engines which it is to contain are placed in position, they will be able to pump something like 45 million gallons into our district in 24 hours. I do not suppose there will be such a large pumping station as that anywhere to compete with it. With respect to the laying of the new 42-inch main, that work has made very considerable progress; and I may state that practically the work is nearly completed. It has been a work of considerable difficulty, and has required the greatest possible care in its construction. The water is passed over the River Lea twice in its course from Lea Bridge to Old Ford, and twice under the River Lea; and this has necessitated a large amount of engineering skill, which has been supplied by our eminent Engineer. As to the building of the engine and boiler-houses, the foundations are now completed; and the Board has this morning decided to invite tenders for their construction. Passing to our other great work—the search for water in the Lea Valley—I may say that the pumping station at Waltham Abbey proceeds in a highly satisfactory manner. We have an abundant supply of water; and the engines there give every satisfaction. At Lea Bridge, the well is practically finished, and already above 400 feet have been driven in the chalk. Up to the present moment, a large quantity of water has not been secured; but the Engineer has no reason to doubt that eventually we shall get all the water we need from it. At Walthamstow, as the proprietors are aware from what has been stated previously, the work has presented great difficulty. The cylinders had to be sunk through a shifting bed of sand, which has given much trouble; and the work has, in fact, been critical. Now, however, the cylinders have been sunk down, and are already 7 feet in the chalk; so you may say that the difficulties connected with that work are practically overcome. At present the contractor is cementing the two lengths of pipe of the upper and lower cylinders together. As soon as this joining is satisfactorily finished, the water will be pumped out, and the comparatively easy work of sinking into the chalk will be commenced. At Walthamstow, the Engineer has no doubt whatever of finding a supply of water. This is a short statement of the works which we have been carrying through. I do not think I shall be doing justice to the Engineer if I did not say at this moment how completely satisfactory to the Board has been the way in which he has carried out these works. They have been projected with a large amount of skill and ability; and his energy and perseverance under all kinds of difficulty have been wonderful. It is only right to state how much the Company are indebted to him. I will now move—"That the Directors' report and accounts submitted to the meeting be received and adopted, and that, as recommended by the Directors, a dividend of £3 15s. per cent., less income-tax, on the ordinary stock of the Company, be declared payable on the 8th of October next."

Mr. H. DALTON seconded the motion, which was at once unanimously passed.

Mr. BLUNDELL moved, and Mr. POOLEY seconded, a vote of thanks to the Chairman and Directors, which was cordially agreed to.

Mr. TENDRON then proposed a vote of thanks to the Secretary, the Engineer, and other officers of the Company. He had, he said, not quite gathered whether the Company had two or three works in hand.

The CHAIRMAN: Two. At Lea Bridge the well is completed; and we are now driving in the chalk for the purpose of securing a better supply of water.

Mr. TENDRON expressed a hope that the Engineer would be successful in finding water before very long. It was, he added, another lesson to the many which had been given to the public, that it was quite a mistaken notion that there was nothing to do but to sink in the chalk to find water.

The CHAIRMAN: I will take this opportunity—and it is a very gratifying duty—to second the vote of thanks to the officers of the Company. I do so with great pleasure, because I do not think many companies are served better by their officers than ours is. We all know the able and courteous way in which the Secretary discharges his duties; and we all fully appreciate him. With respect to the Engineer, it would be impossible for me to say too much in his praise. I have never met anyone who is so devoted to his duties as is our Engineer; and as I have already said, we are really under very great obligations to him. It is not only that he is very skilful in designing works; but he is so careful and energetic in carrying them out. He is therefore entitled to our thanks; and we cannot do less than offer him our congratulations on the success which has attended the works under his care; and I hope that his health will continue to enable him to carry out the works in the same able manner as heretofore.

The motion was carried unanimously.

The CHAIRMAN: The Secretary reminds me that I have not yet acknowledged the vote passed by the meeting, thanking the Directors and myself, and I therefore take the opportunity of doing so now. Our best services are always at the command of the Company, and it is a great pleasure to us to watch over its interests.

The SECRETARY and the ENGINEER subsequently acknowledged the vote to themselves and the staff, and the proceedings then terminated.

IT was agreed, at the last meeting of the Merthyr Board of Guardians, to authorize the Assessment Committee to engage a valuer in connection with the appeal of the Merthyr Local Board for a reduction of the assessment of their water-works. A report of the evidence submitted to the Committee on behalf of the Board appeared in our last issue.

THE DUBLIN CORPORATION AND THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

ARBITRATION PROCEEDINGS.—SOLICITORS' BUILDINGS, FOUR COURTS, DUBLIN.

(*Before Messrs.* VERNON HARCOURT *and* H. E. JONES, C.E., *Arbitrators; and Mr.* J. SHIRESS-WILL, Q.C., *Umpire.*)

MONDAY, SEPT. 30.

To-day, the Arbitrators sat to commence the proceedings to determine a number of questions which had been referred to them under an order of Court and also a deed of submission between the Dublin Corporation and the Alliance and Dublin Consumers' Gas Company. The matters at issue, as our readers are aware, related chiefly to the lighting of the streets, and to the testing of the gas distributed in the city.

Mr. S. WALKER, Q.C., Mr. R. ADAMS, Q.C., and Mr. T. HEALY, M.P., appeared for the Corporation; The MACDERMOT, Q.C., Mr. P. MARTIN, Q.C., Mr. W. KENNY, Q.C., and Mr. A. HOLMES for the Company. Mr. JABEZ CHURCH, M. Inst. C.E., of Westminster, the Company's Consulting Engineer, was also present; Mr. JOHN WEST, of Manchester, attending in a similar capacity for the Corporation.

The Court opened at ten o'clock; but at the request of the parties, the proceedings were adjourned to half-past twelve. On the Arbitrators taking their seats at that hour,

Mr. WALKER, addressing them, said: You kindly gave us time to confer with the leading parties representing each of the litigants, as we may call them; and we have used that time beneficially, I hope, for all, and have discussed verbally, and partly committed to writing, the matters upon which we have agreed. But we shall require to have a formal award made by you, and also certain matters to be done by you which will not involve any difficulty on your part; and we will ask you, if you will kindly do so, to come here to-morrow morning at eleven o'clock, when we will have the terms in writing.

The UMPIRE: I think I may say on behalf of my colleagues and myself that we heartily congratulate you on the happy result that your good sense has attained. We shall be happy to accord with your wishes, and attend here to-morrow at the time named.

TUESDAY, OCT. 1.

This morning the representatives of the Corporation and the Company remained in consultation for nearly two hours beyond the appointed time for commencing business, after which

Mr. WALKER explained to the Arbitrators that the matter which had last occupied the conference was the question of costs. He had now to announce that they had agreed to turn back to back with regard to costs, save that the Company should be paid the costs of the action which they had taken. The agreement to which they had come on the other matters was prepared. One of the provisions of the award was that the Arbitrators should visit the proposed site for the testing-station, which it was proposed should be in Tara Street, provided the Arbitrators did not consider it an unsuitable site. While the Arbitrators were absent inspecting the site, the heads of the award would be engrossed.

The MACDERMOT remarked that he was happy they had come to an arrangement; and the spirit in which they approached it was a desire shared in by both sides, that, where there was a question of great public interest litigated between two large and important public bodies, they should, if possible—if it was substantially right—not quarrel at the end about a mere question of costs. It had been arranged that the Company should be paid the costs of the action which they brought to recover £1826 for gas—that this sum should be paid, and the expenses of the action along with it. With regard to the arbitration, they had decided that each party should bear its own costs. At present, the site of the testing-station was on Burgh Quay. The Corporation had not been satisfied with that; and it was one of the questions the Arbitrators would have to consider. But they had agreed that the site should be removed to Tara Street, subject to the Arbitrators being of opinion that this site was not unsuitable. They would also have to consider what ought to be the arrangements and apparatus employed in the testing-place in conformity with the Gas Acts. These were the only questions.

Mr. WALKER said there was another subject which, however, with the matter referred to by The MacDermot, he had intended to reserve until the return of the Arbitrators—that was the question of notice of intended inspection of the meters, governors, and other plant.

The UMPIRE: I presume you are all agreed that the heads of agreement, which we have not seen, exhaust the reference in both cases.

Mr. WALKER: Yes, except that we have made it part of the agreement that any subjects that are not embodied in the consent, you shall be discharged from finding on.

Mr. JONES asked about the position of the other townships.

The MACDERMOT said their rights were fixed by statute.

Mr. JONES: Are they not entitled to satisfy themselves?

The MACDERMOT said they were; but that matter did not come within the terms of the present reference, which was conversant with the city only.

Mr. WALKER, replying to Mr. Jones, said they had agreed on everything except three points, which they now asked the Arbitrators to decide—"(1) The site of the testing-station shall be in Tara Street, subject to its not being reported unsuitable. (2) The arrangements of the testing-place and the apparatus to be used therein shall be determined by the Arbitrators and Umpire. (3) The Gas Company shall be entitled to inspect and test at all reasonable times the meters, governors, and other lighting plant; the Arbitrators and Umpire to determine whether any and what notice should be given of such inspection."

The MACDERMOT said three parties were entitled to test the gas—Professor Tichborne (the Board of Trade Examiner), the Corporation, and the Gas Company.

The proceedings were then adjourned until half-past three. In the meantime, the Umpire and Arbitrators visited Burgh Quay testing-station and the proposed site at Tara Street, accompanied by Professor Tichborne; Mr. John West, C.E., and Mr. T. J. Cotton, on behalf of the Corporation; and by Mr. W. F. Cotton and Mr. Waterfield on behalf of the Gas Company.

On the resumption of the proceedings,

The UMPIRE announced that the Arbitrators were of opinion that the new station was not unsuitable. With regard to the second point—viz., the arrangement of the testing-places and the apparatus to be used, they would like to know which of the Company's Acts that were still in force contained provisions regarding testing similar to those contained in the Gas-Works Clauses Act of 1871.

Mr. WALKER said there was the Act of 1866, section 61.

The UMPIRE: Is that still in force? That is material.

Mr. WALKER said it was in force. There was also section 4 of the Company's Act of 1871.

The MACDERMOT said that the only Acts that dealt with the matter were the Act of 1866 and the General Act of 1871; and he thought that the two Acts were inconsistent—in other words, that the matter was solely governed by the Act of 1871. He read various sections dealing

with the subject, and said that, although the sections as to tests for sulphur, ammonia, and carbonic acid were not now in force, the Company were quite willing that the Arbitrators should provide for apparatus to make the test.

The UMPIRE thought that was very fair.

Mr. JONES: To what limit would you allow sulphur?

The MACDERMOT: Twenty grains of sulphur, and 5 grains of ammonia in every 100 cubic feet of gas.

Mr. WALKER submitted that the portions of the section provided for these tests was still law; but as the Company had conceded the point, he would not argue it.

The UMPIRE said the third point was in regard to the right to inspect, on the part of the Company, at all reasonable times, the governors, meters, and other lighting plant. That right was conceded; and it appeared all they had to do was to determine if any and what notice was to be given. Supposing they determined that notice was to be given, he would like to hear from the parties what notice they thought would be reasonable.

The MACDERMOT said the Company considered there ought to be no notice. There were from 3000 to 4000 lamps in the city; and in order to ascertain whether a governor or regulator was out of order, they must go and look at it. No one ever heard such a proposition as that they could not examine the governor of a lamp without giving a formal notice. Were the Company every time they thought there was something wrong with a lamp, or before they could examine it, to serve a notice on the Corporation? Of course, if they wanted to remove the regulators to have them properly tested, it would be different.

The UMPIRE suggested that one object of notice in a case like this between two great bodies was that they should not unnecessarily be brought into conflict upon small and trivial matters, and that if there was any common course which would be calculated to prevent differences in future, it would be extremely desirable. If the Company gave (say) two hours' notice that they were going to inspect a regulator, it was quite easy for the Corporation to have some servant there; and then, of course, there would be no room for dispute, and no room for long letters from one side to the other, saying "in your absence we inspected this, and found so and so," and the other side saying "we went back there and found it not so and so." Some middle course like this might tend to preserve a good feeling for the future.

The MACDERMOT said what occurred to him was that the notice would give the friction a vitality and repetition; and it would become a universal law.

The UMPIRE: Look at the security we get if two men, one on each side, go and inspect a regulator at the same time. Nothing but perjury could make them differ.

The MACDERMOT: I do not know, Sir; it is most extraordinary what imagination does.

Mr. WALKER said the Umpire had entirely anticipated him. They thought it would prevent friction if there was some reasonable notice such as the Arbitrators would determine to be sufficient. In London, he believed, 24 hours was given. In St. Pancras and Paddington and other places, that notice was also given.

Mr. JONES asked whether there was any objection that the notice should be mutually given on both sides when it was proposed to remove a lamp for testing or to test a lamp meter *in situ*.

Mr. WALKER replied that the Corporation did not object.

Mr. HARCOURT said he took it that the word "inspect" did not merely mean the inspection by an inspector, who went round and observed that some of the lights in the street were less bright than others.

Mr. WALKER said it did not; only in the case of some manual interference. They would be quite willing that if there was any renewal of the governors or meters by the Corporation, the Company should have an opportunity of attending; and they would give them notice. The learned Counsel then read the agreements as follows:—

Whereas the Arbitrators and Umpire were appointed to determine the following questions:—

1. What shall be the conditions of the future supply and consumption of gas to and by the public lamps of the city of Dublin, in accordance with and under the provisions of the Alliance and Dublin Gas Act, 1883?

2. Whether the site of the testing-station as at present existing is a proper one?

3. Whether proper facilities, as required by the Gas-Works Clauses Act, 1871, are afforded by the Corporation and Company respectively for such testing; and whether the several mains giving supply to the said local authority are properly connected with the testing-station?

And whereas it has been agreed that the said Arbitrators and Umpire shall be discharged from finding on all questions save as hereinafter mentioned, and that an award shall be made to the following effect:—

That the conditions of the future supply and consumption of gas to and by the public lamps of the city of Dublin shall be as follows:

1. The Gas Company shall sell and the Corporation shall purchase, the public lamps, including all lamps, posts, brackets, stands, pipes, lanterns, meters, governors, and stopcocks.

2. The price to be paid by the Corporation to the Gas Company shall be settled by two Arbitrators—one to be named by each party—and an Umpire, to be named by them before entering on the reference; and in case they do not agree on an Umpire, said Umpire to be named by the Board of Trade.

3. The Corporation shall provide proper meters for all metered lamps, to be purchased at either of the establishments of Messrs. Wright or Parkinson, of London.

4. The average meter system shall continue used, the metered lamps to be one in twenty; and when the meter of any lamp from any cause does not register, the average of all other metered lamps of the same class in the city is to determine the registration.

5. The Corporation, when necessary, shall provide all proper governors and burners.

6. The Corporation shall have power to erect lamps of a special pattern; and in each case a special and suitable meter shall be attached to each such lamp or group of lamps.

7. The Gas Company shall be entitled to inspect and test, at all reasonable times, the governors, meters, and other lighting plant; the Arbitrators to determine any and what notice should be given.

8. The register of each meter shall be read and recorded once every month by two officers—one on behalf of the Company, and the other on behalf of the Corporation.

9. Gas accounts shall be furnished and paid monthly.

10. The site of the testing-station shall be in Tara Street, subject to its not being reported unsuitable by the said Arbitrators and Umpire.

11. A lease of the necessary ground in Tara Street with the assent of the Treasury for a term of 999 years shall be made by the Corporation to the Gas Company at a nominal rent.

12. The Gas Company shall with all reasonable expedition, and within a period not to exceed six months from the date of the execution of the lease, erect a proper testing-place on such site in accordance with the provisions of the Gas-Works Clauses Act, 1871, and of the Alliance and Dublin Consumers' Gas Acts.

13. The arrangements of the testing-place and the apparatus to be used thereon, shall be determined by the said Arbitrators and Umpire.

14. In consideration of the Corporation taking over the plant under this agreement, and paying the gas account monthly within 21 days after said accounts have been furnished by the Company to the Corporation, the Company agree that, from and after the 5th of July, 1889, the price to be charged by the Gas Company to the Corporation from and after that date, shall be at the lowest rate charged to any private consumer.

15. In the event of any dispute arising as to the consumption or rate of consumption of gas supplied, it shall be referred to a person to be agreed on, and, failing agreement, to a person to be named by the Board of Trade.

16. The fees of the Arbitrators and Umpire to be paid by the parties moietively; each party to abide their own costs of the arbitration and award.

The agreement in reference to the action between the Company and the Corporation* provided that the Arbitrators should find—"That the plaintiffs supplied to the defendants the quantity of gas in the statement of claim mentioned, and that they are entitled to be paid, in addition to the sum of £5000 already paid, the sum of £1926 3s. 3d; and the defendants shall pay to the plaintiffs the costs of the action, not including the costs of the reference. And, by consent of the plaintiffs and the defendants, we are released from finding on the questions other than the first referred to us by the Court."

Mr. WALKER thanked the Umpire and Arbitrators for accommodating them so liberally in time, and enabling them to arrive at an amicable conclusion.

The UMPIRE: The arrangement come to, I think, appears to be equally satisfactory and honourable to both parties. We shall endeavour to do our duty in carrying out the wishes of both sides.

The proceedings then terminated.

MANCHESTER CORPORATION GAS SUPPLY.

THE RESIDUAL PRODUCTS.

At the Meeting of the Manchester City Council last Wednesday—the MAYOR (Mr. Alderman Batty) presiding—on the motion for the adoption of the proceedings of the Gas Committee, in accordance with the promise made by him at the previous meeting of the Council (*ante*, p. 509), the Deputy-Mayor (Alderman Sir John Harwood) gave some statistics as to the residuals produced at the works under the charge of the Committee.

Alderman LAMB formally moved the confirmation of the minutes.

Sir J. HARWOOD, in seconding the motion, remarked that, at the meeting of the Council a month ago, attention was drawn to the fact that the Gas Committee made less ammoniacal liquor in the year ending March, 1889, than in the year ended March, 1886. The Committee had made every inquiry, and he was prepared to give an explanation of the matter.

Mr. SOUTHERN (interrupting) pointed out that there was great inconvenience in discussing a report which members of the Council who were interested in the subject had not had an opportunity of perusing. The matter did not arise out of the minutes; and it would be much to the advantage of the Council if they could be furnished with a copy of the report, so as to be able to discuss the subject at the next meeting.

Sir J. HARWOOD said that at the last meeting of the Council, Mr. Lloyd made a statement, and he (Sir John) said he should have an answer at the next. The Committee had very carefully inquired into the subject, and found that it was quite true that a little more ammoniacal liquor was produced per ton of coal carbonized in the year ended March, 1886, than in the year ended March, 1889. That difference could not at present be fully explained, as it was found that the amount yielded by different coals and cannels varied considerably. It might be mentioned as the result of inquiries made, and an examination of the published accounts of different gas authorities, that the quantity of ammoniacal liquor varied from 20 to 38 gallons per ton of coal and cannel carbonized. It was satisfactory, however, to note that, while the ammoniacal liquor had decreased in 1889, the quantity of gas and the total value of the whole of the products of a ton of coal carbonized had increased to a greater amount. A table had been prepared which showed the value, calculated upon one common basis, of the gas, ammoniacal liquor, tar, and coke, per ton of coal carbonized in the years ended March 1886 and 1889 respectively. It was as follows:—Value of (20-candle) gas made and sold at 2s. 6d. per 1000 cubic feet per ton of coal carbonized in 1886, 24s. 7d.; in 1889, 25s. 9d. Amount realized for liquor per ton of coal in 1886, 1s. 1·47d; in 1889, 1s. 0·88d. Amount received for tar per ton of coal in 1886, 1s. 7·44d.; in 1889, 1s. 7·03d. Amount realized for coke per ton of coal in 1886, 1s. 10·32d.; in 1889, 1s. 9·72d. These figures gave a total for 1886 of 29s. 1·93d., and for 1889 of 30s. 2·63d. He thought they must be eminently satisfactory.

Mr. LLOYD observed that he was at a loss to understand the figures quoted by Sir J. Harwood. He contended, as at the last meeting, that had the Committee made as much ammoniacal liquor in 1889 as in 1886, there would have been an addition of something like £3000 to the revenue of the Committee.

Sir J. HARWOOD said Mr. Lloyd was unintentionally misleading the Council. Ammoniacal liquor was sold according to the price of sulphate of ammonia in the market; and the difference in the amount received did not therefore arise from the difference in the quantity or the quality of the product.

Mr. LLOYD said nothing had been advanced by the Deputy-Chairman of the Gas Committee to satisfy him; and he still contended that, had the yield been as large in 1889 as in 1886, the income of the Committee would have been something like £9000 in excess of what it was.

Alderman ASQUITH remarked that Mr. Lloyd had not taken into account the difference in the quantities of ammoniacal liquor obtained from different kinds of coal. In years gone by, the Committee purchased expensive cannel and poor coal; but now they had reversed that policy, with the result that they were producing gas in larger quantities and of much better quality. They were obtaining less ammoniacal liquor, but more gas; and he thought the Committee were working on right lines.

Further remarks having been made by other members,

Alderman LAMB, in reply, said if Mr. Lloyd could show the Gas Committee how they could make £4000 or £5000 a year more than they made at present, they would be glad. Mr. Lloyd and Mr. Southern were members of a Committee which, instead of making £106,000 a year, were spending that amount; and yet they attacked the "hen that laid the golden eggs." In 1886 the Gas Committee made a gross profit of £82,200; and in 1889 they had made £106,000. If those gentlemen would turn the scale as regarded their own Committee in favour of the ratepayers, instead of trying to depreciate other Committees, the latter would be obliged.

The minutes of the Committee were confirmed.

* See JOURNAL, Vol. LIII., pp. 767, 908.

OIL LIGHTING IN WEST KENT.

Our local correspondent writes as follows in regard to the oil lighting at Erith and Bromley:—

Now that the lighting season has set in, the good people of Erith have commenced trumpet-tongued declamations and invectives against the present system of lighting in that parish by the Defries system of oil-lamps. For such an experiment no worse spot than Erith could have been selected, as its adjacency to the River Thames exposes it more to the fury of the elements than places further inland. Complaints are still prevalent as to the disagreeable smell emitted from the oil; but by far the greater proportion have reference to the number of lamps to be found in darkness, and to the dim sepulchral gleams obtained from those actually burning. Those members of the Local Board who were in favour of the oil lighting, because they thought it would be economical, are now finding the truth which associates cheapness with nastiness. They are accordingly gradually veering round to an opposition; and it is not likely that they will again support so primitive and ineffective, as well as unreliable a mode of relieving the darkness of their town. The oldest member of the Local Board complains that West Street—a most important thoroughfare—was "almost in darkness" last Sunday evening week; adding that "many of the lights were out, whilst others gave no more light than could be obtained from a rushlight." Another member of the Board speaks in a similar strain of another part of the town; and says that on the night of Saturday, the 28th ult., it was impossible to see across the footpath; whilst the Clerk (Mr. F. Parish) reports that 18 lamps were found not burning at Belvedere and Erith on the following evening. For each of these defaults Messrs. Defries, under their contract, forfeit half-a-crown; so that their contract cannot be accepted as being, under the circumstances, very remunerative. They are now, however, apprised that not only will the Board insist on the full forfeitures, but also on being supplied with an illuminant of the standard agreed upon. This latter intimation is the first the Erith Board has made as to the bad quality of the lighting commodity; but if the Gas Company had been supplying such a poor light, there would, no doubt, long since have been a sharp rebuke.

It is somewhat singular, in the face of this most apparent failure to compete with gas for public illumination, that a neighbouring authority's Clerk speaks favourably of the lighting by oil at Bromley. At any rate, Mr. Mullen, the Clerk of the Bromley Local Board, has advised the Rural Sanitary Authority that the experiment in that town has given such satisfaction as to induce him to recommend the Defries oil-lighting system to be adopted at Fordcroft—a place under the jurisdiction of the Bromley Rural Sanitary Authority. Mr. Mullen is doubtless acting in good faith in this recommendation; but, from inquiries made, the satisfaction testified to by him appears to be very limited and confined. Indeed, this is a solitary testimonial amongst scores of hostile comments as to the lamps getting out of order. Whatever the Bromley Local Board may find satisfactory in this matter, is not apparent to those residing in the locality where the experiment is being tried; and perhaps, after all, the feeling expressed is the outcome of a resolve to be satisfied with almost any sacrifice, so long as it runs counter to the interests of the Gas Company with whom they are continually seeking to make hard contracts.

THE SALFORD GAS-WORKS SCANDAL.

Mr. Hayward and his "Investigations."

Last week and the week before some references were made in our leading columns to the part Mr. Samuel Hayward claims to have played in the unearthing of the malpractices connected with the former management of the Salford Corporation Gas-Works; but the following, from a local correspondent, shows how much (or rather how little) real influence Mr. Hayward had in bringing about the present state of affairs:—

Certainly, one satisfactory result has attended the revival of interest in the Salford scandal. The professed exposer of frauds at Salford, Leeds, Halifax, and elsewhere has been exposed with an unsparing hand. You have already given one or two examples of the boasting of the man. To magnify his own importance, as you know, he declared that he was "on the list of Inspectors for the Local Government Board," and had "been invited by the Society of Civil Engineers to become a member of that body." The doubts you expressed as to the truthfulness of these statements have been justified—in the one case by a letter from Mr. James Forrest, the Secretary to the Institution of Civil Engineers. He says that the name of Mr. Hayward is not on the books of the Institution; and that (as everybody knows) the Society does not invite persons to become candidates for election. As to the second case, Mr. C. N. Dalton, the Assistant Secretary to the Local Government Board, writes that Mr. Hayward "is not, and never has been, one of the Board's Inspectors." In the way of exposure this would seem to be bad enough, and should be sufficient to destroy for ever any claim which the author of such easily-disproved statements may have had on the confidence of his fellow-men. But worse remains behind. A local newspaper has actually published what purports to be an exact reprint of the reports which he made to the Salford Corporation as the result of his boasted "investigation" into the mismanagement of the gas-works; and there could not have been a more cruel exposure. It has been frequently asserted that his information was *nil*, and his reports utterly worthless; but it is difficult to believe that a man could set up a claim to scientific knowledge, to say nothing about public gratitude, on a foundation of such utter rubbish as goes to make up these reports.

When he first went to Salford it was with the boast that, if he were allowed "one week with permission to examine the corporate books, he should be able to produce such a budget as would astonish the ratepayers." They ought certainly to be astonished—as the Gas Investigation Committee must have been—by what he did produce. Here is the opening sentence from the first report, which is undated, but which is headed "Purchases of Oxide of Iron for Gas Purification:—I have gone through the accounts of purchases of this material for past eleven years—that is, from 1876 to 1886, inclusive; and it would be impossible to note every irregularity in the purchase, as there are very few transactions in those years which can be said to have been carried out in a thoroughly straightforward manner, ordered in such a manner as that the quantity required is stated on the order, the price to be paid and the mode and time of delivery." In proof of "the correctness of the foregoing statement," whatever "the foregoing statement" may mean, a few figures are extracted from the order and receipt books. Orders are traced for 290 tons of oxide from 1876 to 1880, and 1280 tons from 1881 to 1886; and the assertion is made that in the former period 1449 tons, and in the latter 2244 tons were "delivered or paid for." Of course, the important question is whether they were paid for and not delivered; but on this point, as on any other of the least significance, the report has nothing to say. The failure to trace a specific order is magnified into a matter of vast importance; but on the one question into which it is at all necessary to inquire, the report is practically silent. Then comes this paragraph: "How delivered: The material has been delivered by the London and North-Western Railway, who have never weighed it at this end, but taken the weights as they were declared by the senders. They are unable to furnish any accounts previous to the year 1881; but for the foregoing reason that cannot be considered reliable, not being their right weight, and frequently not weighed by the London and North-Western Railway at all. I regret from this reason it does not appear possible to trace to the actual source any inaccuracies of weight, as the Railway Company will not be bound by any weight that they have not actually weighed and certified themselves." This is elaborated at great length, without affording the slightest proof of dishonesty, though the particulars quoted tend to show that there had existed, as everyone knew, a very loose system of management. And so Report No. 1 ends.

The author evidently found before long that something was wrong. There was a tremendous difference between his promises and performances—for it was as to the oxide that he professed to have special information—and complaints were not unnaturally made that his revelations revealed nothing. He accordingly commences his second report, which is dated "Manchester, June 16, 1887," in this becomingly apologetic, and ungrammatical style:—"Gentlemen,—If I have incurred the displeasure of some of the members of your Committee because I have not *legally* proved irregularities as to weights and deliveries of oxide which has taken place during the past twelve years and previously, those members of the Committee must take into consideration the fact that it cannot be proved unless you can bring the railway people who delivered the material, and who are prepared to swear to the weight delivered. They cannot swear to any weight delivered, as they never weighed it, but took the weight given them as correct by the senders of the material." Having thus, a second time, admitted that, like Canning's needy knife-grinder, he had "no story to tell," he seems to have immediately sought to correct an admission so damaging to his prospects of payment for his services. "But (he continues) that gross irregularities did exist and continued during years, I am in possession of such evidence, which will be best for the present not to disclose (!) Apart from this, I will venture to say that no one understanding fully the nature of gas-works' sales and purchases, and going through the books and various accounts, as I have done, for the past twelve years, and from railway to railway, to various towns and canal depôts, but must feel thoroughly convinced, as I do, that although the accounts are regularly and properly kept and do not in any way implicate those responsible for the keeping of the accounts—who have acted according to instructions and a total ignorance of anything wrong—that those accounts do not speak the truth, but cover a vast amount of fraud and dishonesty." You probably would not care to give the whole report, entertaining though it is, but you should find space for two or three more paragraphs, which may be taken as samples of the bulk. Here is a particularly choice morsel: "As to purchases by the gas management, a fact is that trucks of fresh oxide said to have been delivered could not have contained the weight of material said to have been in them. As to sales of the gas management in spent oxide, many of the trucks must have contained very much more than is set down to them. One of your officials admitted to me that he recollected on one occasion a cheque was got from the Borough Treasurer for oxide that had not been delivered, or certainly the account had not been passed. He could not remember the date, but knew of such a fact." This appears to be the kind of thing which the author of this document now speaks of as "information" or "evidence" supplied by him to the Corporation. In another place he goes on in this strain: "I say emphatically that the whole of the sales and deliveries of this material [ammoniacal liquor] require to be gone strictly into, not by anyone connected with the Corporation, but by someone thoroughly acquainted with the business, and the deficiency sold by one or more members of your Committee personally. There are great differences between the quantity paid for and the quantity actually delivered. It would pay the Committee well both as to the past in recovering the money for the excessive quantity delivered and not paid for, and to prevent fraud upon the gas management in the future." Then there is a statement as to the lime, which it is admitted was weighed on receipt at the stations, but of which this expert "thinks" too much was used. A statement equally exact and reliable is contained in the following paragraph:—"I have already mentioned that the gas management have either wasted 10,000 or 12,000 tons of coals per annum, or they have not received it; seeing that the make of gas is much under the quantity per ton than any gas-works in England. You make a little over 9000 feet per ton of coal paid for; the average of other works exceeds 10,000 feet." Terms like "a little over" and "exceeds" are not those of the scientist investigating a matter of grave importance, in which large issues are at stake. But the writer it is presumed did his best, here as elsewhere; and it was perhaps as much his misfortune as his fault if the evidence he wanted could not be found, or if possibly he could not see it when it did exist.

In another delightfully vague passage, there is the statement that "the leakage is above the average of any other works (!), and appears disproportionate to the amount of gas sold." As one remedy for this state of things, the refreshingly innocent suggestion is made that "the person responsible for the taking of the meter index at the different stations should be encouraged to give a strictly accurate report." Then follows—*apropos* of nothing in particular—a comparison between the prices charged for gas in London and Salford, coupled with the suggestion that because the price was higher in the northern borough than in the Metropolis, therefore there must have been fraud somewhere. It is needless to say that the so-called comparison fails to take into account any difference of capital charges, conditions of working, contracts, leakage, consumption per mile of main, or any of the hundred and one other points which require to be considered in making a comparison of this kind. It is, indeed, just such a petulant outburst as any aggrieved consumer might address to the editor of his favourite paper, or as that editor, in ignorance of anything beneath the surface of things, might write as a comment on his correspondent's epistle.

The language in which Mr. Hayward clothes his idea is, however, so elegant that I must let him speak for himself once more: "Are these facts he asks, not sufficiently striking as to convince your Committee that there has been something radically wrong in the gas management of the Salford Corporation Gas-Works, and that from mismanagement or something worse there has percolated out somewhere from £30,000 to £40,000 per annum? In your so-called prosperous years you have returned to the relief of the rates out of profits from the gas-works about £18,000 per annum. No great difficulty would be experienced to find practical men who would lease the works and pay a profit of £40,000 to £50,000 per annum, reduce the price to the consumer, make better gas, do all that the previous gas management has done as to paying interest on its loans, &c.—in fact, show a result of £30,000 to £40,000 per annum more."

Fortunately for your readers, there is not much more of it, though I must not pass over in silence the portion of the report which its author sought to dignify by heading it "Recommendations." I have already referred to one piece of valuable advice given to the Corporation. Another is that the Gas Committee should be reduced in number. "Better," says this capable counsellor, "to have a Gas Committee of three gentlemen thoroughly understanding the purchases and sales in gas-works and its general management, than twenty gentlemen who, although they may be

thought business men in their own branch of trade or profession, do not thoroughly understand gas management"—as, the obvious addition is, the author of this report does. The suggestions which follow are puerile in the extreme: "Let every purchase or sale of material be done strictly by contract as far as is possible;" "let the Gas Committee see that they always get the right material and the right weight;" "two invoices should be sent for all goods at least two days before delivery;" let such invoices state distinctly the weight, measure, or quantity to be delivered;" "let every load be strictly weighed," and a certificate of the weight be signed by the Gas Manager, gatekeeper, and weighbridgeman at the works. Incidentally, there are statements that "Bloom Street works require alterations of various kinds;" and that, "at Liverpool Road and Regent Road works, alterations could be made which would be beneficial. The old-fashioned retort-lids should be substituted (*sic*) for self-sealing lids; and the old retort-lids also abolished at Bloom Street, and new self-sealing ones adopted." It is suggested, possibly with some truth, that the author of this brilliant idea had no knowledge that the adoption of an improved form of retort-lids would involve other and more costly changes. There is corresponding doubt as to the extent of his knowledge of the plans which had been in preparation for several years for the remodelling of the Liverpool Street and Bloom Street stations. If he knew of them, his suggestions that "alterations are required" was a distinct attempt to trade on the work of others.

Eleven days after the report was sent in, its author made a remarkable discovery. He found, he says, that he had omitted an item which he "considered a very valuable one;" and he immediately wrote a supplemental document to make up for this omission. It is much like the rest, and contains the "very valuable" suggestion that the Committee should ascertain what quantity of coke had been made and sold during the past ten years. This, said the author of this new discovery, "should be a test upon the quantity of coals actually received and used during that period. A ton of gas coal should yield on an average 15 cwt. of coke in weight, or its equivalent if you sell your coke by the chaldron, of 48 bushels." And so, with this remarkable addendum—characteristic alike of the depth of knowledge and the degree of accuracy found in almost every line of the original document—these reports came to all too early an end. I do not at all see what there was to prevent them being continued indefinitely. They might have been issued in weekly numbers, illustrated by footnotes and a few woodcuts; and in this form could hardly have failed to be an effective rival to some of the, more or less, comic periodicals of the time.

It is natural that a father should have an overwhelming love for his own offspring; and it need therefore excite no surprise that the compiler of these reports sets a fairly high value on them. He was alluding to them when he told a public meeting the other day that "he was perfectly certain that had the Gas Investigation Committee treated him fairly and properly, and acted upon his reports, more besides Hunter would have been in gaol, and £500,000 or £600,000 in the pockets of the ratepayers." In this passage, the native modesty of the man asserts itself. Obviously he might have said five millions, or even six or eight millions sterling, would have been saved had his advice been taken. But he modestly values his information as worth to the ratepayers only £500,000 or £600,000, and is content to rest his claim to public recognition on this comparatively paltry sum. It is superfluous to point out that this assertion—which modest though it really is, some might call bold and audacious—is directly contradicted by the extracts already given from the reports. Nor does it detract at all from the value of the statement that half a million or so could have been saved, to learn that the actual expenditure on material during the whole of Hunter's management of the Salford works only amounted to £700,000. A gentleman who has so happy a disregard of facts is not likely to let figures trouble him; and perhaps one ought to be thankful that in this particular instance the figures are not reversed, and that he has not talked of his ability to recover £700,000 out of £500,000 spent, or to perform some other little feat of an equally easy kind. It is interesting to find that his modesty stood him in good stead when he came to place a value on his services. All he asked from the Corporation for the remarkable information he placed at their disposal was £107. Sad to narrate, he only received £30. What the Investigation Committee obtained for their money, it would possibly puzzle them to tell; though the amount would certainly not have been altogether ill-spent if only its recipient had been put in the witness-box and cross-examined as to his fearful and wonderful production. The amusement which must have resulted would not have been too dearly bought even at £30, or perhaps double that sum.

Exhibition of Gas Appliances at Salford.—Last Wednesday the Mayor of Salford (Mr. Alderman A. L. Dickins) formally opened an exhibition of gas appliances which has been promoted by the Gas Committee of the Corporation, in order to make known to the inhabitants of the borough at large the advantages of gas as a heating agent. The exhibits are placed in a large wooden building (100 feet long by 60 feet wide) which has been erected for the purpose. There are about 20 exhibitors; and the collection of gas apparatus brought together is a very representative one. Messrs. W. Parkinson and Co., of London, show some finely-executed models of large gas station meters, governors, test holders, &c. Messrs. W. and B. Cowan have on view examples of their wet and dry gas-meters—ranging from 2-light up to 200-light—and a number of the ingenious mercurial gas-pressure gauges devised by Messrs. Harrison and Sheard. The burners and appliances for which the Gas Apparatus Company, of Peterborough, Messrs. Stott and Co., Mr. G. Bray, and Mr. T. Heron are noted, occupy prominent places in the exhibition. High-power lamps are shown by the Wenham Lamp Company and Messrs. Henry Greene and Sons. The Wenham Company also exhibit some exceedingly pretty heating stoves in Doulton-ware; and Messrs. Freeman, Emery, and Co. display stoves for heating of various sizes and designs. The exhibitors of cooking-stoves are Messrs. C. Wilson and Sons, of Leeds, Messrs. T. Fletcher and Co., of Warrington, Messrs. J. Wright and Co., of Birmingham, Messrs. R. and A. Main, of Glasgow, and Mr. W. Unsworth, of Warrington. Messrs. Crossley Bros., Limited, have present four of their "Otto" engines; and the Campbell Gas-Engine Company, of Halifax, have on view a ½-horse power machine. The opening proceedings commenced with a luncheon, at which, among other guests, were the Chairman of the Gas Committee (Mr. H. Lord) and the Gas Engineer (Mr. S. Y. Shoubridge). The company afterwards went to the exhibition building, where the Mayor was presented by Mr. Lord with a handsomely bound catalogue of the exhibits as a memento of the occasion. In declaring the exhibition open, his Worship said that during the last eighteen months they had had a good deal of gas in Salford in more ways than one. They were, however, approaching the end of the year; and he hoped that, as they neared Christmas, they would let bygones be bygones. He thought the present Gas Committee deserved great commendation for the work they had done, and that they had at heart the interests of the borough and the ratepayers. A vote of thanks was passed to the Mayor at the conclusion of his address, which was very interesting and to the point. Lectures on cooking are being given by Miss H. M. Young, morning and evening, in connection with the exhibition.

DUMBARTON CORPORATION GAS SUPPLY.

The Annual Accounts.

The Dumbarton Corporation gas accounts for the year ending Aug. 1, 1889, have been made up and rendered available for reference. They indicate a very satisfactory condition of affairs. The revenue amounted to £7072, of which £6089 was received for gas-rental, while £901 is entered as sales ledger account. On the expenditure side, the largest item—£2418—is for coals; the cost of lime being £142. Salaries and wages run up to £932; while the outlay for wear and tear is set down at £332, and that for fittings at £119. The sinking fund account totals up to £265. The foregoing items and sundry others make up an expenditure of £5519; so that there is a balance of £1553. Under the head of profit and loss account, last year's stock is entered at £952; the "Common Good," at £300; and the gas undertaking, at £1216. These sums, with an item of 6s. 8d. for irrecoverable arrears, yield a total of £2469. The balance of the revenue and expenditure accounts—£1552—together with stocks of gas, coal, char, lime, gas-fittings, &c., and certain arrears, make up a similar total. In the shape of debts, the capital account shows a total of £34,672, of which the item of £13,500 is against annuitants for their several holdings in the Dumbarton Corporation gas annuities. Then there is a sum of £10,350 as loans on debenture. As the balance of consumers' deposit accounts there is entered amongst the debts a sum of £1231. Another large item is the balance in the shape of accumulated profits, amounting to £9576. In respect of the assets side of the capital account, the largest entry is £31,405; being the amount expended in the gas undertaking up to Aug. 1, 1888. Certain extensions were made during the year ending Aug. 1, 1889, represented by an entry of £31. House property and cash make up the remainder of the total of £34,672. The sinking fund on Aug. 1 last year stood at £2258; and with the addition made to it during the past year, it was brought up to £2524 as at Aug. 1 last. Up to that date there had been expended in purchasing gas annuities a total of £2375; and there was also a balance in the bank on deposit receipt amounting to £148. These two items make a total equal to the amount of the sinking fund account.

GAS WORKMEN AND THE LABOUR QUESTION.

In the course of the proceedings at the meeting of the Birmingham City Council last Tuesday, Mr. Eli Bloor asked whether any decision had been come to by the Gas Committee in reference to the memorial from the stokers employed at the Corporation Gas-Works, praying for a daily eight hours' shift in place of twelve hours, as at present; also if it would affect the engine-drivers, who worked above eighty hours per week. Alderman Pollack said he was sorry he could not answer the question fully. As the Council were aware, the Gas Committee had decided to substitute eight hours for twelve hours shifts where continuous day and night labour was carried on. To enter into details would prejudice communications that were taking place between the Engineers and the men interested in this matter; and all he could say was that the Gas Committee had made most generous offers to the men—offers which ought to be perfectly satisfactory to them—and those offers would favourably affect the engine-drivers. The Gas Committee would take the earliest opportunity of reporting on the whole question. On the same day, a prolonged conference took place between the Engineers (Messrs. Charles Hunt and Henry Hack) and representatives of the men; and the result was afterwards reported to the Gas Committee. It appears that the Committee are willing to put on sufficient additional men to allow of eight-hour shifts, and to pay an extra 3d. a day, making 5s. 3d., in lieu of what, under the London Companies, is called "good-time money." They require, however, that the men should do rather more work in eight hours than they would have done in eight hours out of the twelve under the present system. Concerning the Windsor Street works, it is agreed that to charge 52 retorts is a fair proportion for eight hours of the 66 charged in twelve hours; the same basis being applied to the other works. At Saltley, where the retorts have to be both charged and drawn, the men claim that 26 are enough to do in eight hours; but the Sub-Committee and the Engineers propose 27. A special meeting of the Gas Committee was held last Thursday. The Works Sub-Committee reported the proposals of the gas stokers with reference to the amount of work to be done now that it has been decided to adopt the eight-hours shift; and after some discussion, it was resolved to agree to these terms—that the eight hours' work of the carbonizers should be reckoned on the basis of 52 mouthpieces charged at Windsor Street, and 26 charged and drawn at Saltley, Adderley Street, and Swan Village. It now only remains to decide to what extent the work of the carbonizers other than stokers shall be reduced. The new arrangement with the stokers cannot be acted upon until these details have been settled; but it is not anticipated that any difficulty will arise in that respect, and the new terms will probably be wholly agreed upon and made operative within a week or ten days. The concession which has been made amounts to a reduction of about 22½ per cent. on the work hitherto performed by the men, and an increase of 3d. per turn in their wages—equal to about 1s. 7½d. per week. This increase, it is said, will cost the town about £13,000 a year.

Several meetings have been held lately at Leeds by the men engaged at the Corporation Gas-Works, to discuss the various reforms that they require; and the following statement has been unanimously passed for presentation to the Gas Committee:—"That stokers, firemen, and coal-wheelers shall work eight hours per shift; that stokers shall charge and draw 20 retorts per man; that each fireman look after eight fires and clinker four; that stokers and firemen be paid at the rate of 5s. per day; that coal-wheelers be paid 4s. per day; that yardmen and purifier men receive an advance of 4d. per day." The method of working at New Wortley gas-works being different from that of the other stations, it was resolved that the following rules apply to the men employed there:—"That on the 6s. each stoker shall charge and draw 18 retorts; each fireman on the 6s. to look after six fires and clinker three; that on the 5s. each stoker shall charge and draw 20 retorts; each fireman on the 5s. to look after eight fires and clinker four; that coal-wheelers shall wheel coal as follows:—For the 5s., 40 retorts twice each shift, on the 6s., 36 retorts twice each shift." The following to apply to all gas workers:—"Time-and-a-half for all overtime; Christmas Day and Good Friday to be paid double time; permanent hands to have one week's annual holiday, and receive payment for the same."

The agitation for an advance of wages among the stokers, wheelers, and yardmen employed at the various stations of the Bristol United Gaslight Company has at last assumed a definite form. The stokers apply for an increase of 8½d. per day, which would make their wages 5s. for each eight hours' shift. The wheelers demand a rise of 7½d. a day; and as their present wages amount to 3s. 4½d., that would make their remuneration 4s. a day. The yardmen apply for a rise of 6d. a day; bringing up their wages to 3s. 6d. The whole of the men are unanimous in demanding that the week's holiday, which in former years was allowed, should still be given without any cessation of pay, and that the winter hands shall have the same leisure time in proportion to those who are engaged throughout the year. The men have had interviews with the

Secretary (Mr. J. V. Green) and the Directors, by whom an offer was made, which was considered satisfactory, as the Board were understood to practically accede to the demands of their *employés*. The proposals of the Directors were as follows:—For settings of fives: A gang of 18 stokers to work 40 retorts; 7 cwt. charges, of eight hours' duration, equal to 46·6 cwt. per man; eight hours' shifts; 5s. per shift. Three coal wheelers to put down the coal for 40 retorts as above; eight hours' shifts; 4s. per shift. Three coke wheelers to dought and remove the coke from 40 retorts as above; eight hours' shifts; 4s. per shift. For settings of sixes: A gang of 18 stokers to work 36 retorts; 6 cwt. charges, of six hours' duration, equal to 48 cwt. per man; eight hours' shifts; 5s. per shift. Three coal wheelers to put the coal down for 36 retorts; eight hours' shifts; 4s. per shift. Three coke wheelers to dought and remove the coke from 36 retorts; eight hours' shifts; 4s. per shift. (1) The work to be arranged upon a give-and-take line to suit each station. (2) In working settings of fives, stokers will be relieved from wheeling 35 cwt., and will carbonize an additional 11·6 cwt. of coal. (3) When working settings of sixes, stokers will be relieved from coal wheeling, and carbonize an additional 13 cwt. of coal. When, however, the men came to consider these proposals, at a meeting which was called for the purpose, it was shown that under them the men would have to carbonize 3 tons of coal each shift, or 16 cwt. 1 qr. more than at present, to secure the increased pay; and they were unanimously rejected. They further decided to send in their notices on Wednesday last. This was done; so that, unless an amicable settlement is arrived at, they will cease work to-morrow. The number of hands affected by this dispute is somewhere about 600. The Directors have advertised for stokers and wheelers to work at their three stations at 35s. and 28s. per week respectively. They guarantee permanent work to one-half of the men thus taken on; and undertake that the other half shall be retained until April next. It is also reported that about 26 large towns have been written to appealing for assistance. The men have held meetings to arrange their "plan of campaign," and already "picketting" has commenced. The men have been informed that they must not expect a reply from the Directors before to-day (Tuesday).

There exists a feeling of discontent at the Halifax Corporation Gas-Works, and another strike is not improbable. The men held a meeting a couple of days ago on a moor in the vicinity of the town, at which they aired their grievances in a feeling manner. It appears that one cause of their dissatisfaction is the attempt being made by the ruling authority to prohibit the taking of beer into the works. The general feeling among the men is that a limited supply of beer is part of their food; and they ought not, within reasonable limits, to be interfered with.

LANCASHIRE CORPORATIONS AND ELECTRIC LIGHTING.

During the past few days several of the Corporations in Lancashire have come to a decision in respect to the notices of intended application by various companies for Provisional Orders for the supply of the electric light in their boroughs. At Rochdale—one of the more important of these towns—the Town Council last Thursday endorsed a recommendation of the Gas Committee that the Corporation should not themselves make application. Mr. Ald. Petrie, in explanation of the Committee's decision, stated that they had considered whether the business of supplying the electric light would pay; and on this subject they had received a report from Mr. T. Banbury Ball, their Gas Engineer, which he considered by far the clearest statement yet issued on the financial aspect of the question. According to that report, if they carried the electric lighting business to a triumphant success, the Act of Parliament only permitted them to make 5 per cent. profit; whereas a private company could make more than this. The Committee had therefore come to the unanimous resolution to make the present recommendation to the Council. Before giving their consent to any application, they would be able to make terms with one of the three companies who had given notice; and, if not, they could oppose them, and so protect the interests of the town. The Burnley Corporation, on the other hand, intend to apply for an Order. A deputation representing the Gas Committee has visited Bradford and Leeds, and though, as one of its members stated, they were advised by the Chairman of the Electric Light Committee of the Leeds Corporation to "make haste slowly" in the matter, they came to the conclusion that it would be better for the Corporation to undertake the work, and so maintain control over their own streets. The Town Council have endorsed this view. The Bolton Corporation intend to "play a waiting game." Questioned last Wednesday as to the intention of the Gas Committee, Mr. Ald. Miles said they did not purpose immediately following the example of Bradford. They must first be enlightened as to the success of the undertaking; but, in the meantime, the Committee would strenuously oppose the applications of other parties for powers. The Wigan Corporation will oppose the applications of electric lighting companies only so far as may be necessary to protect the interests of the borough, and not for the purpose of preventing the companies coming to the town with the electric light. The Oldham Corporation, who some time ago empowered a Committee to take steps in the matter, intend to make application for an Order and to maintain the supply of electricity in its own hands. They have already a small installation in connection with one or two public buildings. Bacup is another town which will apply for an Order. In all the places referred to, except the last, the gas supply is in the hands of the Corporation; and therefore the divergent views taken of the question of the opposition of the electric light in these cases are not without interest.

THE PROPOSED CORPORATION ELECTRIC LIGHTING INSTALLATION AT LEEDS.

The members of the Leeds County Council were engaged on Wednesday last discussing a motion by Mr. W. H. L. Hardwick—"That the Council apply to the Board of Trade for a Provisional Order under the authority of the Electric Lighting Acts, 1882 and 1888, authorizing the Corporation, as the local authority under the Acts, to provide and supply electricity for public and private lighting purposes within the area referred to in the report presented to the Council on the 3rd of July last, at an estimated total capital expenditure of £68,000; and that the Town Clerk, in conjunction with the Electric Lighting Committee, be authorized and empowered to take all necessary legal and other proceedings, and to give all notices on behalf of the Council which may be necessary in connection with the application to the Board for and obtaining such Provisional Order." In support of the resolution, the mover simply referred to the figures given in the report which appeared on p. 651 of the JOURNAL last week. Mr. Hepworth seconded the motion. Mr. Ambler, in supporting the motion, said that the time had arrived when the Corporation should take some active steps for providing the town with the electric light. Alderman Scarr stated that he had carefully considered the matter, and could not see his way to vote for it. Alderman Tatham said the cost of electric lighting had been brought within reasonable bounds; and if there was a sufficient demand for the light, it would be much better to endeavour to supply it than allow companies to come in for the purpose of doing so. Mr. Gilston, the Chairman of the Gas Committee, was sorry he could not see his way to vote for the resolution. Electric lighting had not yet passed the experimental stage; and much had yet to be learnt with regard to it. That being so, he did not see why they should rush in and lay down an installation for any particular part of the borough, more especially as he believed that comparatively few people would be prepared to take the light. He suggested that they should wait some time longer, in order that they might have the benefit of the experience being obtained in connection with the great installation at Deptford and kindred enterprises. After further discussion, in which the speakers appeared to be about equal in favour of and against the resolution, Mr. Hunt moved, and Mr. Dawson seconded, an amendment that the further consideration of the resolution be deferred for six months; and, on being put to the meeting, this was agreed to by 28 votes to 17.

ELECTRIC LIGHTING IN THE METROPOLIS.

A Special Meeting of the Commissioners of Sewers of the City of London was held last Tuesday—Mr. G. MANNERS in the chair—with reference to the subject of electric lighting.

Mr. BRIDGMAN moved—"That the abstract of tenders for electric lighting be printed and circulated for the information of the Commissioners."

Mr. SLY had on the *agenda* the following amendment:—"That the report of the Streets Committee of July 30, on electric lighting, and the abstract of tenders, be printed and circulated among the members of the Commission;" and this he moved.

Mr. INNES seconded the amendment; observing that it would be very convenient to the Committee if, when the printing took place, they had some information about the abstract of the tenders when the City was previously lighted by electricity.

Mr. PANNELL said he had been closely connected with the electric lighting question while it was under discussion in the Committee, and he did not think it would be any advantage to go back to the original contracts under which the City was more or less efficiently and sufficiently lighted, unless they followed the whole history of the matter from that time up to the present.

The amendment having been carried,

Mr. PANNELL asked whether the Engineer had any information which it would be desirable to include when the report was presented.

The ENGINEER (Mr. W. Haywood) said he did not think the report would give all that was required, and for this reason a specification was prepared. Companies had sent in their tenders; but nearly all had made modifications, so that they did not strictly agree with the conditions the Commission had drawn up. There was information as to the modifications suggested, which it would be well the Commission should have.

Mr. INNES said he had no desire to obstruct the electric lighting; but it would take the Commissioners a long time to make themselves masters of the information scattered through a series of reports and cash accounts. He moved—"That, in addition, the Engineer be requested to supply the names of the Companies who lighted the City experimentally some years since, the districts lighted, and the result of the experiments up to the present day."

This was negatived.

Mr. PANNELL then moved, in addition, that the Engineer and Mr. Preece be requested to amend the abstract of tenders so as to make it uniform with the conditions under which the various companies are now prepared to contract. They would then have each of the companies' proposals before them.

Mr. BEDFORD seconded the motion, which was accepted by Mr. Sly, and agreed to.

An Adjourned Meeting of the Paddington Vestry was held last Thursday—Mr. JACKSON in the chair—to consider the subject of carrying out a scheme of electric lighting in the parish.

Mr. MARK JUDGE proposed—"That, inasmuch as the Electric Lighting Committee has not seen its way to recommend the Vestry to itself undertake to provide electricity for lighting and other purposes in the borough, it is desirable that steps be now taken to secure its being done at an early date by private enterprise, under a Provisional Order approved by the Vestry as the Local Authority."

Mr. W. H. MILLS seconded the motion.

Mr. SEE contended that the Committee had not fairly and fully considered the matter; and appealed to the Vestry to pause before they threw away the chance of providing the parish with the electric light by themselves undertaking the supply. He moved, as an amendment, that the matter be referred to a Special Committee.

Deputy Surgeon-General JESSOP seconded the amendment.

After some discussion, the amendment was withdrawn, and the motion carried. It was then resolved to refer the matter to a Committee, to prepare a draft Provisional Order by making such modifications in, and additions to the latest Model Order issued by the Board of Trade as to provide for two complete systems of public lighting extending throughout the borough, so that they may be used concurrently or separately; the Vestry to be entitled to purchase the undertaking at the expiration of 21 and 31 years respectively.

WEST GLOUCESTER WATER COMPANY.—The half-yearly meeting of this Company was held on Saturday, the 28th ult., at the Company's offices in Bristol—Mr. A. Brogden presiding. The Directors in their report stated that the accounts for the half year ending June 30 last showed a profit of £183, which, with the previous balance, made the sum of £292 to the credit of the revenue account. Since the date of the meeting held in March last, 370 additional services had been laid on; making the total number of houses now served by the Company 1367, the water revenue from which, including some supplied by meter, was estimated to produce £1059 per annum; being an increase of £280 on the annual revenue during the half year. These figures show that the growth of the revenue was upwards of 35 per cent. during the half year, whilst the working expenses have been somewhat less than in the previous six months. The report was adopted.

BEIGHTON WATER SUPPLY.—At the recent Local Government Board inquiry at Beighton (*ante*, p. 566) on a proposal, by the Rotherham Rural Sanitary Authority, to borrow £2000 for carrying out a scheme of water supply, it was stated that the Chesterfield Rural Sanitary Authority already supplied a portion of the parish at the rate of 9d. per 1000 gallons; and the Inspector (Colonel W. M. Ducat) asked whether they were prepared to supply the whole parish on these terms. According to the present agreement, the authority have power to suspend or discontinue the supply on account of drought, accident, or the requirements of their Union; so that in no case would the ratepayers be called upon to suffer through giving a supply to Beighton. The Inspector, at the inquiry, stated that there did not appear to him to be a proper agreement between the two Authorities; and he would withhold his report until the receipt of such an agreement. At the last meeting of the Chesterfield Authority, it was resolved to inform the Rotherham Guardians that they were prepared to supply the whole of Beighton on the existing terms.

STOCKTON AND MIDDLESBROUGH CORPORATIONS' WATER BOARD.

THE SUPPLY TO THE OUT-DISTRICTS—PROPOSED FRESH APPLICATION TO PARLIAMENT—QUARTERLY RETURN.

At the Meeting of the Stockton and Middlesbrough Corporations' Water Board last Monday week—Alderman Hugh Bell presiding—the General Manager (Mr. D. D. Wilson) reported the receipt of a letter from the Clerk to the Stockton Rural Sanitary Authority, stating that they were prepared to guarantee the Board a revenue of 10 per cent. on the cost incurred in giving a supply of water to the villages of Eggleseliffe and Billingham. The cost of laying on the water would be about £1100. The members thought that the work had better be proceeded with; and gave Mr. Wilson instructions to prepare the usual form of agreement. The Board then resolved itself into Committee to consider a memorandum on the water supply which had been prepared by the General Manager, and a proposal to promote a new Bill in Parliament for the granting of extended powers. After some discussion, the consideration of the subject was adjourned to a future meeting. The usual quarterly return was subsequently presented. During the three months ending Aug. 13, 849,182,000 gallons of water were distributed by the Board; 604,328,000 gallons of which were supplied by meter. This shows an increase on the corresponding quarter of last year of over 76,000,000 gallons; the increase in meter consumption at the works being 45,000,000 gallons. The revenue for the same period was £15,256—an increase of nearly £1000 as compared with 1888. The quarter's expenditure on revenue account was £1906; and, notwithstanding the large increase in supply and revenue, this shows a decrease compared with the three months ending Aug. 13, 1888, of above £20 The total expenditure of the Board during the past quarter on revenue and capital accounts reached £75,526.

THE WATER SUPPLY OF NEW YORK.

CONSTRUCTION OF NEW RESERVOIRS.

Our contemporary, the *Scientific American*, has recently published an article from the pen of Mr. Harold Brown, C.E., which gives some particulars of the works that are being carried out on the Croton River for improving the water supply of New York City. Two dams are to be constructed, which will furnish two large reservoirs, to be called into service in case of the failure of Croton Lake. These will be known as Sodom dam reservoir and Bog Brook reservoir; and it is estimated that together they will have a capacity of 9000 million gallons, or nearly four-and-a-half times the storeage accommodation of the present Croton reservoir. According to the specifications, Sodom dam is to be built on the east branch of Croton River, and is to consist of a masonry dam, presenting at its deepest part a height of about 78 feet (exclusive of the foundation below the river bed), a width at the base of about 47 feet, and a total length of about 500 feet, with a uniform thickness at the top of 12 feet. A gate-house is also to be constructed of masonry; a pipe-vault and fountains, with all the connecting pipes; a masonry overflow connected with the masonry dam by an earth embankment, which is to contain a centre wall of masonry; a spillway and river walls; and all work necessary to take care of the river water during construction. The object of the dam is to impound the waters collected by its tributary watershed for storeage purposes. The Sodom dam and Bog Brook reservoirs are to be connected by a tunnel aqueduct, the approaches are to be made in earth and rock excavation, and are to be finished in masonry. The tunnel is to be lined with brick, and the space between the extrados of the tunnel arch and the line of excavation is to be filled in with dry rock filling or rubble masonry, according to the nature of the material excavated and the character of the rock roof. The tunnel aqueduct is to be circular in section, and about 10 feet in diameter. Advantage has been taken of a piece of high ground to locate the spillway upon a course almost parallel to the general course of the river. The masonry dam seems to be admirably adapted to its purpose. A roadway 12 feet wide runs along its crest the entire length, and also along the top of the spillway embankment. In the construction of the embankments, the earth to be used is to be free from stones larger than 3 inches in diameter. All perishable matter is to be excluded. The embankments are to be formed in horizontal layers not more than 6 inches in thickness, thoroughly rolled with heavy grooved rollers wherever practicable, and rammed by hand where the roller cannot reach. Each layer is copiously watered; so that the layers may be kneaded or puddled together. An extra width of 12 inches is to be provided on the slopes; and the surface left is to be dressed smoothly to receive the broken stones that are strewn thickly about to support the final surface of paving. The thickness of the paving in the spillway and in the slope walls of the embankment is to be 18 inches. Each stone will be set solid on the foundation of broken stone or earth, without allowing any interstices. In the river walls large stones are to be used, especially for the face, the walls to be bounded with frequent headers—that is stones running with their longest axes transversely in the wall. Large heavy stones loosely piled, may be used in some portions of the work wherever it would not be detrimental to the embankment behind it. After the slopes which are to receive the slope walls have been dressed, a layer of broken stones 12 inches thick is to be spread as a foundation for the paving. Rubble stone masonry is to be used for the side walls of the overflow spillway, for the weir of the overflow and adjoining parts, and for the centre wall of the main embankment. This centre wall at its greatest width is to be 6 feet through, and at the top 5 feet. The embankment, with its wall core of masonry, extends some 760 feet in a direct line. At the extreme base it is about 115 feet in width, with a slope of 2 to 1. The crest of the spillway is 10 feet below the crest of the dam; and it is proportioned to carry off the maximum storm flow with a depth of five feet of water, so that the water should never be less than 5 feet below the crest of the dam. The length of the overflow crest is 500 feet, and calculations based upon the data of rainfall for this watershed would indicate that length to be sufficient. The masonry dam is to be built of sound quarry stone, roughly rectangular, with all irregular and feather edges hammered off. Their beds must be good, and present such even surfaces that, when lowering a stone on the level surface prepared to receive it, there can be no doubt that the mortar will fill all spaces. The largest stones are not to measure more than 20 cubic feet. The masonry of the dam is to be laid on its outer faces in ranged courses. Each course is to be composed of two stretchers and one header alternately, the stretchers not to be less than 3 feet nor more than 7 feet long, and the headers of each successive course are to alternate approximately in vertical position. The rise of the courses is to vary from bottom to top from 30 inches to 15 inches in approximate vertical progression; and the width of the bed of stretchers is not to be at any point less than 28 inches. The headers are to be not less than 4 feet in length. The face joints are to be pointed with pure Portland cement after the whole structure is completed. The specifications provide for an optional layer of brickwork on the inner face of the dam. In this work the bricks will be heated to a certain temperature, the mortar to be made of a mixture of Trinidad asphaltum and plaster of Paris.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

Contrary to my expectation, the Edinburgh and Leith Gas Commission on Monday did not throw any interest into their proceedings. The public meeting only lasted ten minutes; and most of it was taken up by Mr. Kinloch Anderson, who seems to have a *penchant* for picking holes in public in the coats of the Commissioners, but which holes, when looked into, are not found to be serious rents. Last March he made the extraordinary discovery that the output of gas in February of this year was less than that of February of last year, and obtained a remit to look into the matter, which was done; but, I suppose, in mercy to him, the explanation why it was so was never made public. The reasons were fully given in my "Notes" at the time. On this occasion, it was the price of coke that he "jumped upon." He called attention to the offer by the Works Committee to sell coke to John Waddell and Sons at 5s. 6d. per ton, and stated that during the whole summer coke was so scarce in Edinburgh that traders were obliged to send to Glasgow for it, at a cost of 7s. 10d. per ton. No one was able off-hand to give a reason for this, though the Chairman, Provost Aitken, of Leith, made the remark that the offer of the Messrs. Waddell was for 500 tons, and the subject was sent back to the Committee to confer with the Engineer (Mr. Mitchell) upon. After this the business was trotted through as fast as the Clerk could read the headings of the different Committee meetings; and each was agreed to *nem. con.* Even upon the important subject of giving discounts no explanation was afforded of how the proposals of the Finance Committee would affect the revenue of the Commission. These are to be at the rate of 2½ per cent. upon accounts between £50 and £125; and at the rate of 5 per cent. upon accounts above £125. As I have said before, I consider the policy a good one; but cannot approve of the silent way of adopting it. I do not look upon the Commissioners as a body who have *carte blanche* to manage the gas undertakings, no questions being asked so long as they can present a satisfactory balance at the close of the year. They are public servants, not masters; and the public should be aware, at all times, of how the business is being carried on. There is too much of the Committee system already in the Commission—borrowed, no doubt, from the Edinburgh Town Council, in connection with which the public are just beginning to realize that when carried to the excess the Council has done, Committees are apt to develop into a species of "rings" with specific objects in view, which do not always result in benefit to the community. Then, again, the Commissioners, on the subject of electric lighting, seemed to agree to the recommendation of the Works Committee to refuse their consent to the applications by electric lighting companies. It was impossible to say whether they did so or not; but it was remitted to Mr. Beveridge, the Parliamentary Solicitor, to draft a resolution which would be submitted to the Commission a month hence, and I suspect that then it will be adopted *simpliciter*, without remark. The other business before the Commission was all foreshadowed in my "Notes" last week.

The Dundee Gas Commission met on Wednesday, but had little business to transact beyond the ordinary receipt of reports and passing of accounts. Mr. Lindsay, as one of a deputation who visited London, Paris, and other places to inspect electric lighting arrangements, stated that they were prepared to give a brief verbal report; but on the advice of the Clerk, a full report would be prepared and laid before another meeting. From his remark that he had no doubt that ere long electric lighting would be in general use in the city, it is apparent that the deputation are prepared to report favourably upon the proposal that the Commission should establish an installation. At a meeting of the Police Commission on Thursday, one of the members made the sensible proposal that the question of introducing the electric light should be put before the electors at the forthcoming elections.

A very good illustration of how the cost of electric lighting runs up, to the dismay of users of it, occurs in connection with a new hospital at Montrose. The managers resolved to light the building by electricity, which would, however, cease at ten o'clock at night, when the engine stopped; and for the further night lighting, gas was to be used. An estimate for the electric lighting plant on these conditions was taken. On Tuesday, however, at a meeting of the managers, it was reported that their electrician now advised them to dispense with gas altogether; and to expend a further £250 10s. upon storeage batteries and new lamps. Deducting £133 8s. 7d., the estimated cost of gas-fittings, the net additional cost to the Board would be £117 1s. 5d. The managers unsuspectingly adopted this recommendation.

The Banchory Gas Company have paid a dividend for the past half year at the rate of 5 per cent.; and have reduced the price of gas 10d. per 1000 cubic feet. A year ago they also made a reduction of 10d. The price is now 7s. 6d. per 1000 cubic feet, which is still too high; and before the Company can expect to do much business, they will require to make an effort to reduce it still further. Is there any necessity for gas of the high illuminating power which is common in Scotland, being supplied in small places like Banchory? Gas of 10-candle power less would do equally as well; and the saving on the cost of coal would allow of it being sold at a much more reasonable rate.

An autumn gathering in connection with Edinburgh University has just been held. One of the lectures was on "The Structure of Gas," by Professor Tait, of Edinburgh; and in the interest of your readers I attended it, but was disappointed. The lecture bore no practical purpose whatever; and it was of so scrappy a nature that it can be of no scientific value. It was simply a series of scientific tit-bits strung together, and given in such a way as to produce an occasional titter amongst an auditory who did not care for science, but were delighted to hear the wonderful expounded *à la* Jules Verne. Other two lectures were given by a Dr. A. C. Elliott upon electric lighting, which were more to the purpose; the lecturer giving a good description of electric lighting plant, and the production of the light. That was his province; but, like all electric lighting evangelists, he could not stay in it, but must needs wander into the political aspect of the question. In his first lecture he told his hearers that gas had the disadvantages of being dangerous; of forming sulphurous fumes, and consequently destroying household goods; and of necessitating complicated arrangements to be made for ventilation. Electric lighting had many advantages, and practically no disadvantages. Taking into consideration the sums of money spent in connection with gas, and which would not require to be expended were the electric light in use, the electricity bill, so far as Edinburgh was concerned, might not be higher than the old gas bill; and yet that, by a calculation based upon the present price of gas in Edinburgh, an hour's reading by that light might be had for 0·015 pence, and that taking the price of 1000 hours of the electric light at 7½d. to the consumer, the cost of one "candle hour" might be stated at 0·025 pence, or an increase of 60 per cent. on that of gas. I do not think there is a discrepancy here, although at first sight it appears so. He evidently means that in the mass the sum paid would not be greater, because people would not use so much light as they do at present—that is, they would be more careful of it; but that the charge, light for light, would be higher

I am willing to put that interpretation upon his remarks as the most reasonable one for him; but I dispute the conclusion. People are not so careful of things in constant use; and I am afraid, when the fictitious labelling of electric lamps as being of so much candle power is taken into consideration, it would be found in practice that the bill, if individually higher, would also, in the mass, be very much higher.

The Edinburgh and District Water Trust on Monday fixed the water assessments for the current year at the same rate as last year—viz., 6½d. in the pound for the domestic rate, 2d. upon the shop rental, and 1d. for the public rate. The Trustees had a long discussion upon their public policy; but on account of the length which these "Notes" have already run to, I am afraid I cannot write further upon the matter this week.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

At the last monthly meeting of the Kilmarnock Town Council, it was reported in the minutes of the Corporation Gas Committee that during the month ending Sept. 14, the amount of gas manufactured showed an increase of about 50,000 cubic feet, as compared with the quantity made in the corresponding period of last year, the total make for the month having been 3,522,100 feet. Even such a comparatively small increase, at such a time of the year, shows that the trade of the town and district must be in a very satisfactory condition. The average illuminating power of the gas over the month was 27 standard candles. The minutes of the Watching and Lighting Committee submitted to the same meeting showed that the expenditure on gas for the street lamps was estimated at £677, as compared with £650 7s. 5d., the actual expenditure under the same head during the past financial year.

The first general meeting of the shareholders of the reconstructed Kilwinning Gaslight Company, Limited, was held last Tuesday. The Directors' report for the past year, which was submitted and approved of, showed a profit which admitted of a dividend of 5 per cent. on the £8 shares, being equal to 8s. per share to all the shareholders of the old company, and 4s. per share to the new shareholders, who were only entitled to half a year's dividend. It was resolved to continue the price of gas at 4s. 2d. per 1000 cubic feet, and to apply a balance of £76 to the reduction of the permanent debt.

It would almost seem as if the town of Airdrie was in a very backward condition as regards its street lighting, judging by remarks made on the subject at a meeting of the Town Council held on Thursday evening. One of the Councillors stated that there was no lamp either in Colliertree Road or Grahamshill; and as to Fowest Street, which was the longest street in the town, there was only one public lamp. Bailie Adam mentioned Queen Victoria Street as being altogether destitute of lamps. With respect to Colliertree Road, Bailie Rankin (Convener of the Lighting Committee) stated that from an estimate of the probable cost, a sum of £80 would be required for the necessary piping; and that only one-half of the road was within the burgh. He did not suppose that the Gas Company would be inclined to assist in laying the pipes. The custom had been for the proprietors to bear a proportion of the cost; but in this case the proprietors would not do anything. It was alleged by Mr. Adam that the Lighting Committee were much too niggardly in their provision of public lamps. Mr. Arthur referred to the transition state of the lighting of the burgh (whatever that may mean), and distinctly objected to any more additional lighting just now. After a somewhat long discussion on the subject, it was agreed by a considerable majority to delay further lighting in the meantime. At the same meeting of the Council, the question of the electric lighting of the burgh was up for consideration. Bailie Rankin said that the Committee had got the draft advertisement referring to the Provisional Order prepared for publication; and the Town Clerk reported that the House-to-House Electric Lighting Company had resolved to proceed no further if the Council were determined to apply for a Provisional Order. They would be glad, however, to contract for the electric lighting for the Council. This matter also led to a lot of talk, the result of which was that it was agreed to go on with the advertisements. Provost Motherwell, who presided at the meeting, told the Council that the expense of getting a Provisional Order would be about £400; and he urged that if they did not intend to go on with the electric lighting there was no use in getting an Order.

At the monthly meeting of the Hamilton Town Council held on Thursday evening, a minute of the Gas Committee was submitted which stated that the Manager's report for the months of August and September showed the average illuminating power of the gas to have been 28 standard candles; and the cost per 1000 cubic feet to have been 9½d. for August, and 10d. for September.

It is stated that Messrs. T. P. Miller and Co., of the Cambuslang Dye-Works, have resolved to put down the necessary machinery for an electric lighting installation.

The foregoing bit of news makes it proper for me to mention that an important conference took place last Tuesday evening between the Directors of the Cambuslang Gas Company, and the deputation appointed at the recent meeting which the gas consumers of the village and district held to protest against the quality of the gas supplied to them, and the price which they were charged for it. Dr. Henry Muirhead, Chairman of the Gas Company, presided; and the proceedings were of considerable interest. Long statements were made by Mr. M. Gilmour, Chairman of the Local Authority, who had presided at the consumers' meeting, and Mr. D. N. Miller, who was one of the leading speakers at the meeting. Dr. Muirhead admitted that the gas had been very bad, and he was sorry that it had been so; but the Directors had made new arrangements, and these, when carried out, would no doubt give the consumers satisfaction. He stated also that the Manager (whom they had now dismissed) had been making gas at a loss, and they had appointed a new Manager. Mr. Gilmour strongly urged that the Directors should agree to reduce the price of the gas from 4s. 4½d. to 3s. 9d. per 1000 feet, which would be a fair price for gas having an illuminating power of 22 or 23 candles; and yet there was an impression abroad amongst the consumers that it might be supplied at 3s. 6d. per 1000 feet. If better gas, at the lower price, were given, he felt confident that many persons who were using paraffin oil as their illuminant would return to the use of gas. They (the deputation) had not come to use any threat, but in a friendly way to see whether they could not get the grievances removed which they complained of. One of the grievances strongly put by Mr. Miller was the deposit system on which the Gas Company worked, and which was scarcely fair and just to the consumers. He held that the deposit should, in the first place, be moderate in amount; in the second place, that it should be repaid when a reasonable time had elapsed; thirdly, that interest on the deposit ought to be given; and, fourthly, that the system should be impartial all round, not being applied only to the villagers while the feuars and villa residents on the hill were allowed to escape. In the course of the proceedings, it was announced that Mr. Wm. Key, of the Tradeston Gas-Works, who was present, had at the request of the Directors tested the gas. On being introduced to the meeting by the Chairman, Mr. Key made a long statement regarding the condition of the gas at Cambuslang, the prices of gas elsewhere, the question of deposits in certain places that he knew of, and the faulty methods of consuming the gas, which he illustrated by experiments with different burners. Mr. Lindsay Miller, one of the Directors, also had something to say. Eventually, the Chairman announced that the Directors were in favour of reducing the price of the gas 5d. per 1000 feet—from 4s. 4½d. to 3s. 11½d.; but that if they did so it would be necessary to make a charge for the public lamps. After some further conversation, in which Directors and deputationists alike took part, Dr. Muirhead stated that they would consult the shareholders as to what ought to be done under the circumstances that had been so fully stated.

There has been another week of almost continuous excitement in the Glasgow pig iron market. The price has not only exceeded 50s. per ton for Scotch market iron, the highest price known since the year 1832, but yesterday it ran up to 51s. 1½d. per ton cash. The stock in the public market stores has now been reduced to less than 1,000,000 tons, or will be in a day or two. An exceedingly brisk condition of things all round is now showing itself.

The coal trade shows more firmness in prices; and the demand is going on increasing from day to day.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 5.

Sulphate of Ammonia.—While prompt parcels still bring good values, the market generally wears a dull aspect. The decline in the London market has naturally not tended to improve the general feeling in the country; and although makers maintain a firm attitude, and act with tact in the disposal of their production, some doubts must exist as regards the future, if the present tendency does not improve. The actual demand from consumers for October delivery is very slow; and even the French orders which were expected are as yet conspicuous by their absence. There is yet, however, a possibility of sufficient requirements by speculators to prevent a further fall. Quotations are meanwhile all below those of a week ago; and there is not much actual business passing. Hull prices are £12 to £11 17s. 6d.; Leith and Liverpool, £11 17s. 6d. Nitrate is depressed; and September-November sailings can be bought at a shade over 8s. 9d. per cwt. The position is unfavourable. The shipments from Jan. 1 to Sept. 30 this year were 520,000 tons, against 390,000 tons in 1888, and 325,000 tons in 1887; and the stocks (United Kingdom and Continent) on Sept. 30 last were 140,000 tons, against 42,000 tons in 1888, and 19,000 tons in 1887.

LONDON, *Oct.* 5.

Tar Products.—Business gets more brisk every week. The larger output is, as a rule, being removed as made; and stocks do not appear in any direction to be increasing. Pitch is being quoted at better prices, ranging from 24s. to 28s.; but at the higher figure comparatively little business has so far been done. With the advance, however, in coal and other fuel, it is quite probable that higher prices still may rule for pitch. Benzols are steady, at last week's prices; but solvent naphtha for prompt delivery is very strong at 1s. 8d. High prices have been paid for crude naphtha—higher, indeed, than the prospects of benzol appear to warrant. Light oils and creosote are in good demand, and firm at their present prices. Carbolic acid seems quiet; but it will not probably recede from its present price. Anthracene is firm; and 1s. 1½d. is being asked for "A" quality, and 11½d. to 1s. for "B" quality. There are, however, no important transactions at these figures. Prices may be taken as follows:—Pitch, 24s. to 28s. per ton. Tar, 25s. to 30s. per ton, according to position. Benzols (90 per cent.), 3s. 2d. per gallon; (50 per cent.), 2s. 3d. per gallon. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 6d. to 1s. 8d. per gallon. Crude naphtha (30 per cent.), 1s. 2d. per gallon. Light oil, 4d. per gallon. Creosote, 2½d. per gallon. Carbolic acid (60's), 3s. 5d. to 3s. 6d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 1d. to 1s. 1½d. per unit; "B" quality, 11½d. to 1s. per unit.

Ammonia Products.—Sulphate of ammonia is scarcely so strong; and sales have been effected at £11 17s. 6d. to £12 2s. 6d. per ton. Prices: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £19 10s. per ton; white, £28 per ton. Sal ammoniac, £33 to £34 per ton.

ANTWERP WATER COMPANY, LIMITED.—According to the report of this Company, the gross income for the half year ended June last was £10,567; and the net revenue, £4701. The recent disastrous explosion and fire at Antwerp did not in any way damage the Company's property.

PROPOSED ELECTRIC LIGHTING IN THE KINGSTON-ON-THAMES DISTRICT.—The Kingston-on-Thames Corporation have decided to apply to the Board of Trade, in conjunction with other neighbouring authorities, for a Provisional Order to enable them to supply electricity in the district for lighting purposes.

THE ADVANCE IN THE PRICE OF GAS AT BARNSLEY.—A meeting of the ratepayers of Barnsley, convened by the Mayor of that borough (Mr. Alderman T. Marsden), in response to a numerously signed requisition, was held at Barnsley last Wednesday night, to consider the action of the Gas Company in raising the price of gas from 3s. per 1000 cubic feet to 3s. 4d. The fact that no less than 1000 people were present, testifies to the great interest taken in the matter by the public. The Mayor having been elected to the chair, Mr. C. Wray moved the first resolution, as follows:—"That this meeting is of opinion that the advance in the price of gas is uncalled for, and pledges itself to use every legitimate means to oppose it." He maintained that the consumers had been paying too much for the gas in the past. When the works were originally erected—about 60 years ago—it might have reasonably been contended that it was a speculation which might fail, and that those who took the risks had a right to the sweets. But even taking into consideration the risk which was first undertaken, the present charge for gas in the town was too high; and the risk had been compensated for many times over. For 40 or 50 years the shareholders had been receiving a good dividend; and altogether it had been a most profitable concern. He had no doubt if the Corporation offered to buy the undertaking at £200 for every £100 worth of stock, the offer would be rejected by the Company. He considered it was high time the people of Barnsley combined in the matter, and endeavoured to put an end to the imposition by the Company. The advance, he said, was also uncalled for because it would be detrimental to the interests of the borough. Mr. W. Tune seconded the motion, which was supported by Mr. Charlesworth, who strongly urged that the consumers should not rest satisfied until the price was reduced to 2s. 6d. per 1000 cubic feet. The resolution was carried. Mr. G. Wheelhouse moved the second resolution—"That, considering the unwillingness of gas consumers to submit to the proposed advance in the price of gas, the Town Council is hereby strongly urged to push on to a speedy conclusion their deliberations on the question of electric lighting." This was seconded by Mr. Calvert, and unanimously passed.

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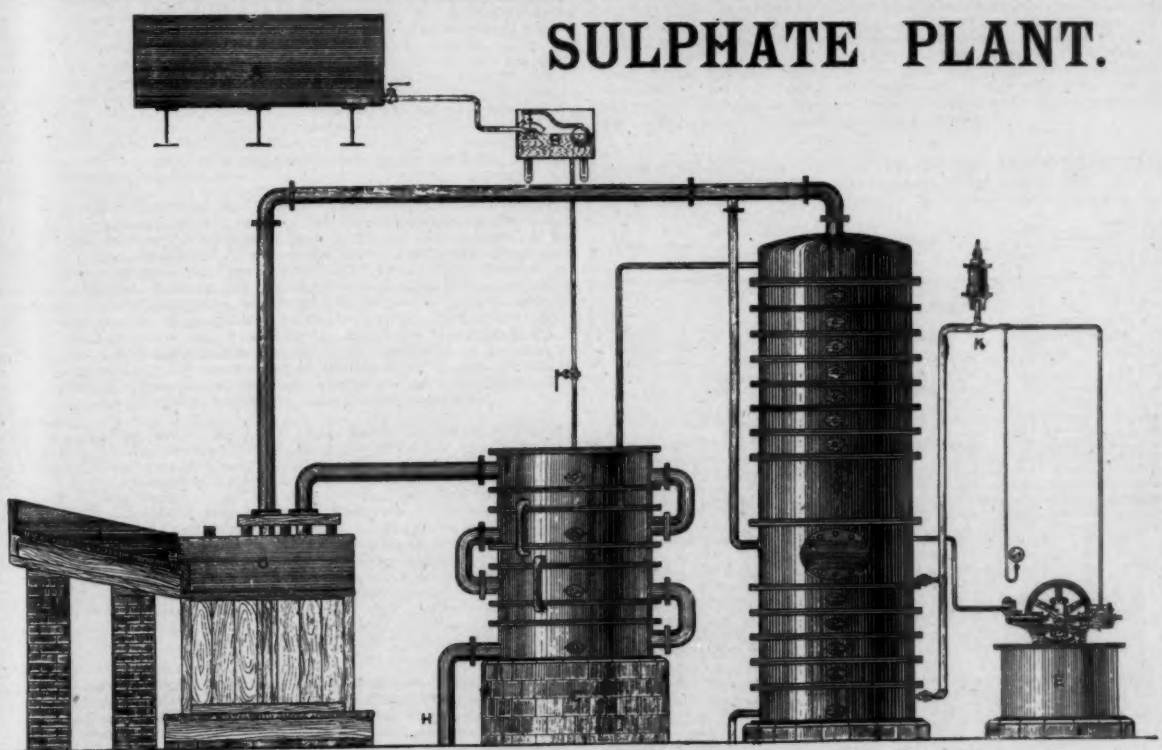

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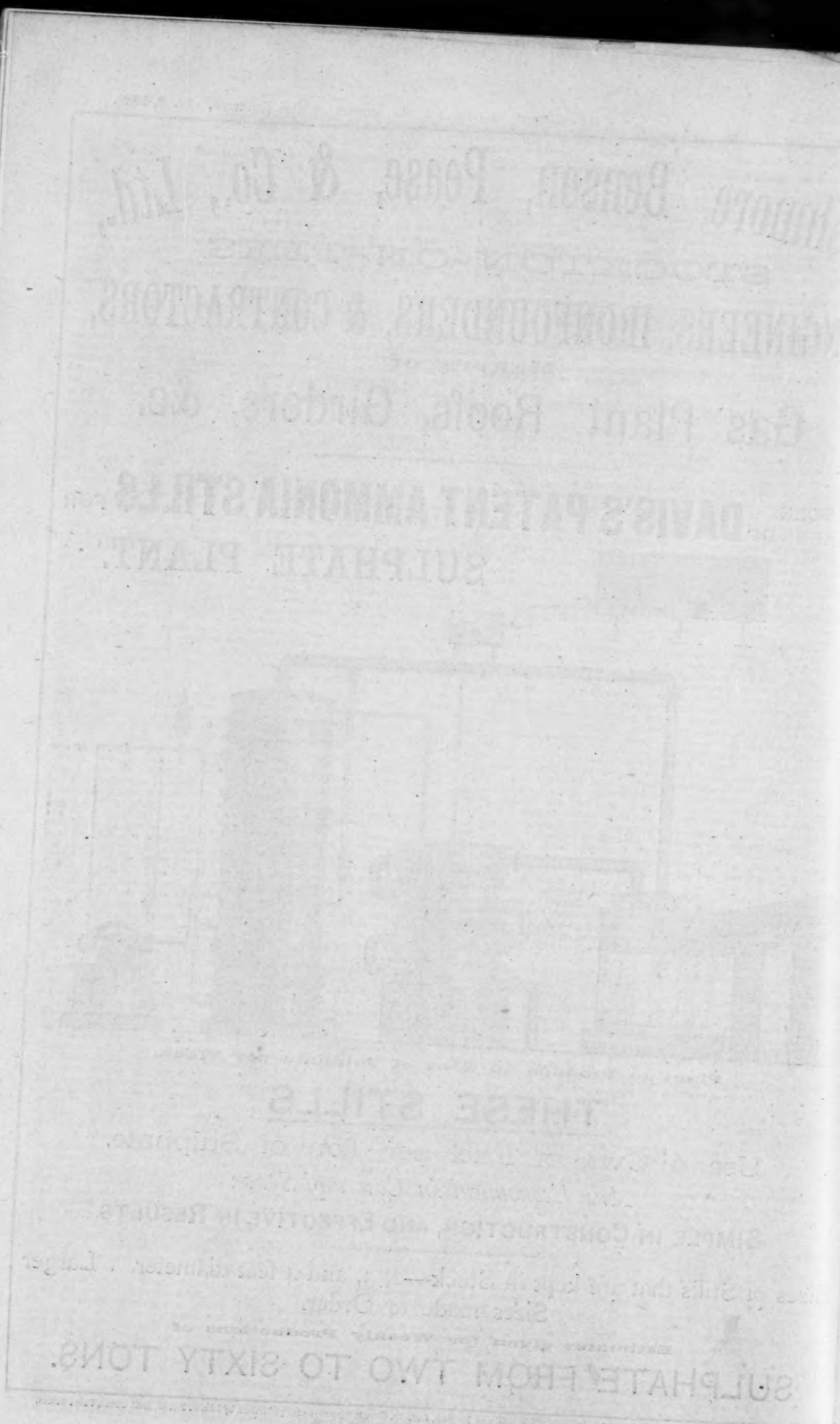


A Substantial Reduction.—The Wilton Corporation, who recently acquired the property of the Gas Company, have announced a reduction in the price of gas from 5s. to 4s. per 1000 cubic feet.

Electrical Accessories Company, Limited.—A Company under this title has been registered with a capital of £5000, in £1 shares, to carry on the business of electricians, gas and general lighting engineers, &c.

San Paulo Gas Company, Limited.—The report of the Directors of this Company for the half year ending June 30 last, states that out of the profit balance of £8101, it is proposed to pay an interim dividend at the rate of 10 per cent. per annum, tax free, to place £2000 to the freight equalization account, and to carry forward £1101.

The Eccup Reservoir of the Leeds Corporation.—At the meeting of the Leeds Corporation Water Committee last Tuesday, seven tenders were submitted for reconstructing the puddle wall at the Eccup reservoir, and that of Messrs. Gould and Stephenson, of Hunslet, who offered to do the work for slightly under £7000, was accepted. The section of work now being let does not include the construction of the wing trench, which formed part of the project that the Borough Engineer (Mr. T. Hewson) recommended, and which would cost about £15,000.

The Extension of the Malvern Gas-Works.—Last Friday Colonel W. M. Ducat, R.E., one of the Local Government Board Inspectors, held an inquiry at the office of the Malvern Local Board, in consequence of the Board having applied to the Local Government Board for permission to borrow £3000 for gas-works extensions. The Clerk (Mr. W. Lambert) explained that the consumption of gas in the town had increased from 17 million cubic feet in 1875, to 31 million cubic feet in 1888; and the present storeage capacity was insufficient. The charge for gas was 4s. per 1000 cubic feet. The cost of the erection of gas-works was £20,000, and the debt on them was £4940. There was no opposition to the application.

New Sulphate Plant at Mossley.—In June last the Gas Committee of the Mossley Corporation decided to erect a building, and put down plant for the manufacture of sulphate of ammonia. It was estimated at the time that the total cost would be £900; and that instead of selling the ammoniacal liquor at from 11s. to 12s. per ton, the Committee would be able to manufacture it into sulphate of ammonia, and receive from this product something like £250 a year, or equal to about 1d. per 1000 cubic feet reduction in the price of gas. The building has now been completed, and the plant—which is on Dr. Feldmann's system—will be ready for operation in about a fortnight's time. The Manager of the gas-works (Mr. R. Merrell) is superintending the erection; and everything is being done with an eye to economy.

The Electric Lighting of Barnet.—According to Messrs. Joel and Co., the contractors for the lighting of Barnet by electricity, better things are in store for the inhabitants in respect to the illumination of the streets. Messrs. Joel have informed the Local Board that they have entered into negotiations for the transfer of all their property and rights at Barnet (subject, of course, to the sanction of the Board) to the United Gas Improvement Company, who have secured the English patents for the Heisber system of incandescent electric lighting. This system, they state, "has now had a trial of some four or five years in America, where some thirty or forty towns have adopted it, in every case with the most satisfactory results." At the meeting of the Board on Tuesday, the Lighting Committee recommended that any application for a transfer of the lighting contract should be considered; and this was agreed to.

Preston Corporation Water Supply.—The Preston Borough Engineer (Mr. H. Reah, C.E.) has reported on the water supply of the town. He points out that the only iron main to supply the town with water was laid in 1856, and that, if this were to burst, the only means of obtaining water would be through an old disused and very insecure brick culvert connecting the Fulwood and Grimsargh reservoirs. To do this would mean that mills and other works requiring a water supply would have to stop, and a great portion of the town would be without water. Under the circumstances, he considers it desirable that an additional iron main should be laid from the reservoirs to the town. He recommends that the existing 20-inch main between Preston and Ribbleton should be abandoned, and a new 24-inch one substituted. The Borough Engineer also recommends the construction of an additional reservoir at Alston to hold at least 120 million gallons. He calculates the cost of the proposed works at about £60,000.

The Charges of the Barnstaple Water Company.—A public meeting was held at Barnstaple on Monday last week for the purpose of receiving a report of a Committee appointed in February last to represent the ratepayers to negotiate with the Water Company, who had raised the water-rate to 5 per cent. on the gross rental. The Mayor (Mr. R. Ashton) presided. The Committee reported that when they saw the Directors in February, they stated that, at the end of the six months' collection, they would reconsider the charge, which they hoped would be considerably reduced. Finding in July that no reduction was to be made, the Committee wrote asking the Directors what new circumstances had arisen to justify them in adopting so different an attitude. To that communication no reply had been received. The adoption of the report having been moved, Mr. Hiern, in seconding the motion, said it looked very much as if the hopes held out seven months ago by the Directors were insincere. He found, according to the balance-sheet of the Company, that a much larger sum had been raised during the past half year than was required to pay the maximum dividends. The motion was carried.

Electric Lighting in Birmingham.—It may be remembered that the Birmingham City Council some short time ago passed a resolution withholding consent to the application of Messrs. Chamberlain and Hookham to the Board of Trade for a Provisional Order empowering them to supply electricity for public and private purposes if the larger area outside the central area of the city were insisted on, but authorizing the General Purposes Committee to consent to the Order if the amendments of the Corporation were accepted; subject to such modifications of detail as the Committee or the Board of Trade might deem proper. The General Purposes Committee have decided to report to the Council that, after considerable correspondence with the promoters and the Board of Trade on the subject, a new and revised Order was sent to the Town Clerk by the Board of Trade, limiting the portion of the borough to be supplied to that comprised in the central area, as desired by the Corporation, and accepting and adopting a large number of their amendments. The Committee, being of opinion that the Corporation amendments not inserted by the Board of Trade were unimportant, had no hesitation in giving their consent to the Order in its amended form, and accordingly authorized the Town Clerk to affix the corporate seal thereto, believing that the interests of the Corporation had been protected as far as was practicable.

New Water-Works for Blidworth, near Mansfield.—New water-works have just been completed, and were formally inaugurated last Thursday for the supply of the village of Blidworth. The scheme, which has been carried out by the Mansfield Rural Sanitary Authority, cost £1650.

Reading Corporation Water Supply.—At the meeting of the Reading Town Council last Thursday, the Committee appointed to deal with the question of the water supply of the borough reported that they had considered the report by Mr. J. Mansergh, C.E., which had been presented to them (see *ante*, p. 654), and had passed the following resolution: "That as it would be almost impossible to mature a scheme for obtaining a Special Act or a Provisional Order in the next session of Parliament, the Committee do recommend to the Council that no decisive step be taken upon this subject until after the return of Mr. Mansergh and the completion of the works which have to be executed at the Arrow Head; and that in the meantime the matter be more fully considered by the Council." On the approval of the Committee's proceedings being moved, an amendment was submitted in the following terms:—"That no delay should take place in taking steps with reference to the water supply; and that the question be referred back to the Committee of the entire Council, with instructions to report upon the whole question of Mr. Mansergh's report, or such other scheme as may be thought desirable." This was eventually carried.

Retford Corporation Water-Works.—The Town Council of Retford, having applied to the Local Government Board for sanction to borrow £2000 for works of water supply, the Board directed an inquiry into the subject matter of the application; and last Wednesday Mr. T. Codrington, M. Inst. C.E., attended at the Town Hall to receive evidence. From statements made by the Town Clerk (Mr. S. Jones) and the Water Manager (Mr. F. Bailey), it appeared that a sum of £737 had already been actually expended in additions and alterations; that between £700 and £800 was estimated to be required to be spent almost immediately in the laying of new mains and other works; and he asked that the balance might be allowed to remain in the hands of the local authority, in view of any contingencies which might arise. Upon the Inspector observing that this balance seemed to be a large one for a small town, the Town Clerk said the money would not be spent unless it was absolutely needed. If sanction was given, loans could be obtained when required; and it would save the trouble of again applying for permission to borrow. He further remarked that the income from the water-works did not cover the expenditure, and that the undertaking was £157 short this year. Mr. Bailey said there were now 2050 out of 2500 houses already supplied with water. The Inspector said he would report to the Local Government Board.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see *ante*, p. 686.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	19—20	..	5 5 0
100,000	10	„	7½	Do. 7 p. c.	10	18—14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	25—27	−1	7 8 2
200,000	5	15 May	7½	Bombay, Limited	5	7½—8	..	4 13 0
40,000	5	„	7½	Do. New	4	5—5½	..	5 9 4
880,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	228—233	..	5 5 2
125,000	„	„	9½	Do. New	100	162—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44	..	5 0 0
320,000	20	27 Sept.	11½	British	20	45—47*	..	4 15 9
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
89,000	10	„	8	Do. 7 p. c.	10	14—16	..	5 0 0
328,750	10	30 May	10	Buenos Ayres (New) Limited	10	13½—14½	−½	6 18 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	108—109	..	5 10 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	11 Apr.	18½	Commercial, Old Stock	100	267—272	−2	5 1 1
180,000	„	„	10½	Do. New do.	100	213—218	..	4 18 0
180,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	„	13	Do. New '69 & '72	14	33—34	..	5 6 7
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205*	..	4 17 7
234,050	10	26 July	13	European, Limited	10	24½—25½	..	5 1 1
120,000	10	„	13	Do. New.	7½	17½—18½	..	5 5 8
354,050	10	„	13	Do. do.	5	12—12½	..	5 3 9
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	248—253	+5½	5 8 8
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	..	3 16 11
80,000	„	„	5	Do. F, 5 p. c. Prf.	100	128—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	„	„	7	Do. H, 7 p. c. max.	100	166—171	..	4 1 10
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,061,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	121—124	..	3 4 6
294,850	„	„	4½	Do. 4½ p. c. do.	100	127—131	..	3 8 8
650,000	„	„	6	Do. 6 p. c. do.	100	171—175	..	3 8 6
3,600,000	Stck.	15 May	10	Imperial Continental	100	207—212	−3½	4 14 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113-115*	+½	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	21—22	..	5 9 1
150,000	5	30 May	10	Oriental, Limited	5	9—9½	..	5 5 8
60,000	5	27 Sept.	7	Ottoman, Limited	5	6—6½*	..	5 7 7
166,870	10	26 July	4	Pará, Limited	10	4½—5½	..	5 3
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	103—107	..	12 1
500,000	100	1 June	6	2nd Do.	100	98—102	..	17 8
100,000	10	26 Apr	10	San Paulo, Limited	10	16—18	..	11 1
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	310—320	+½	1 7
1,350,000	„	„	12½	Do. B do.	100	229—234	−8	3 7
141,500	„	„	13½	Do. C do.	100	340—350	−10	6 0
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	139—143	..	9 11
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	273—278	..	3 8 4
1,720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	215—220	..	3 8 2
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—148	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	260—265	−1	3 7 11
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118-121*	..	3 6 1
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	173—178	..	3 7 5
1,126,500	100	„	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272	..	3 13 6
						*Ex div.		

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

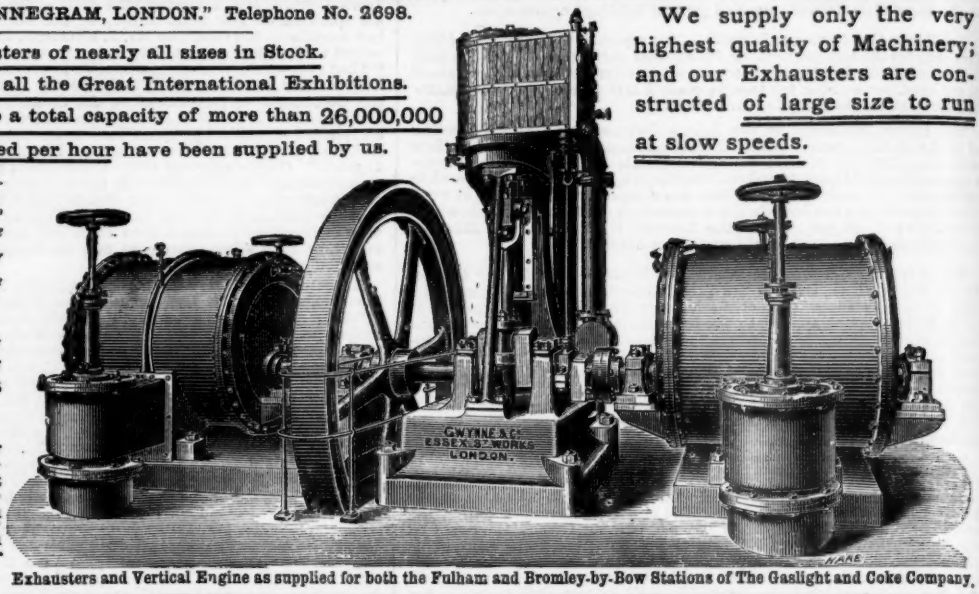
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / No. 54, BERNARD STREET, LEITH, } SCOTLAND.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.

Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

SITUATION wanted, as Outdoor Inspec- tor or FOREMAN of Gas-Fitters. Well up in Main and Service Laying, and in Meter, Stove, and House Fittings of all kinds; and acquainted with the general work of a Gas Company. Reliable; good testimonials.

Address G. C., 20, Tollington Road, HOLLOWAY, N.

TRAVELLER, calling upon Gas-Works, and having a good Connection among Gas Managers, will be pleased to accept Commissions from one or two Manufacturers of first-class Gas Plant.

Address No. 1752, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation by the Manage of a Gas Engineering Works. Thoroughly understands the practical Manufacture of every description of Gas Plant; also Designing and Estimating Cost of same. First-class References.

Address No. 1754, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOKER wanted, by the Aberdare Gas Company. Good Wages and constant Employment offered to a competent and reliable Man.

Apply, with copies of Testimonials, to EVAN JONES, Manager and Secretary, Gas Company, ABERDARE.

THE Corporation of Halifax are prepared to receive APPLICATIONS for the post of OUTDOOR FOREMAN of the Gas Department.

Full particulars of duties may be obtained on application to the Gas Engineer, Mr. Thomas Holgate.

Wages, 35s. per week.

Applications, in applicants' own handwriting, accompanied by not more than three copies of recent testimonials, to be sent to the undersigned on or before Thursday, the 17th of October, 1889.

KEIGHLEY WALTON, Town Clerk.

Town Hall, Halifax, Oct. 3, 1889.

TIMMIS & CO., of STOURBRIDGE

Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.

Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,

Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 671 of last week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1880, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

Telegraphic Address: "Braddock, Oldham."

COKE CLERK.

WANTED, an Assistant Coke Clerk (not less than 20 years of age) at a Gas-Works near London. One who has filled a similar office preferred. Salary to commence at £60 per annum, paid monthly.

Address, giving reference and Salary required, to the CHAIRMAN, Gas Company, GLOSSOP.

WANTED, a thoroughly practical Mana- ger for Works making about 40 million feet per annum. Must be a strict disciplinarian, and possess good general knowledge of all routine Work.

Address, giving reference and Salary required, to the CHAIRMAN, Gas Company, GLOSSOP.

WANTED, immediately, a Gas-Fitter. He will have to assist in Main and Service Laying, &c. To a first-class Man, good Wages will be given.

Address, giving References, Mr. SAM. S. MELLOR, Gas-Works, NORTHWICH.

WANTED, 50 "Bower" Gas-Lamps on the Regenerative Principle. Must be new, or in condition equal to it. Single ones bought.

Address, stating net Cash Price, No. 1755, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady and industrious MAN to undertake the Night Duties on a small Gas-Works. Wages, £1 per week.

Apply to the MANAGER, Gas-Works, Tetbury, GLOUCESTERSHIRE.

SOUTH METROPOLITAN GAS COMPANY.

£50,000 Five per Cent. Perpetual Debenture Stock of the above Company, presenting an Investment of the soundest description.

MR. G. A. WILKINSON is instructed by the Directors to SELL by AUCTION, at the Mart, on Friday, Oct. 18, at Two o'clock precisely, in numerous Lots, to suit large and small Purchasers, £50,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK in the SOUTH METROPOLITAN GAS COMPANY.

The Districts supplied by the Company comprise nearly the whole of the South of London, from Wandsworth to Plumstead Marshes, and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten years.

Particulars may be had of FRANK BUSH, Esq., Secretary to the Company, 709A, OLD KENT ROAD; of, Messrs. JOHNSON, BUDD, and JOHNSON, Solicitors, 24, AUSTIN FRIARS; and of Mr. G. A. WILKINSON, Auctioneer and Land Agent, 7, Poultry, CITY.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.

120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*

Highest References and all particulars supplied on application.

BREEZE FURNACES FOR STEAM RAISING AND RETORT FIRING.

MELDRUM BROS. are prepared to fit up their APPARATUS *on approval* to Lancashire, Cornish, and Egg-ended Boilers.

See advertisement on title page last week.

26, Half Street, Cathedral Yard, MANCHESTER.

ESTABLISHED 1869.

HYDRATED Oxide of Iron (Bog Ore). Purity and Uniformity of Quality guaranteed. Stocks kept at MINES for direct Shipments to any Port, also at Garston Docks.

GEO. G. BLACKWELL, Mine Proprietor, 25, 26, and 27, Irwell Chambers, W. LIVERPOOL.

NOTICE OF REMOVAL.

WE have pleasure in informing Engin- eers, Secretaries, Managers, and the Trade that wehave REMOVED to more commodious Offices at MANSION HOUSE CHAMBERS, 20, BUCKLERSBURY, LONDON, E.C., where all Communications will receive, as heretofore, our immediate attention.

J. & H. ROBUS,
Contractors for Gas and Water Works, Mansion House Chambers, 20, Bucklersbury, E.C.

FOR SALE—Single Gasholder, 42 feet diameter by 14 ft. 6 in. deep. Capacity, 18,000 cubic feet.

Apply to the BISHOP'S STORTFORD GAS COMPANY, LIMITED, BISHOP'S STORTFORD.

BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Hali- fax Corporation are prepared to receive TENDERS for the supply of 90 RETORT MOUTHPIECES, with Self-Sealing Lids.

Plans and Specifications may be seen, and forms of tender obtained, on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.

Tenders, endorsed "Mouthpieces," must be sent to the undersigned on or before Thursday, the 17th of October, 1889.

By order,
KEIGHLEY WALTON, Town Clerk.

BOROUGH OF HALIFAX.

THE Gas-Works Committeeof the Hali- fax Corporation are prepared to receive TENDERS for the supply and fixing of the ASCENSION-PIPES, HYDRAULIC MAINS, FOUL MAINS, and VALVES required for a new Retort-Bench at their Gas-Works.

Plans and specification may be seen, and forms of tender obtained, on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.

Tenders, endorsed "Hydraulics," must be sent to the undersigned on or before Ten a.m., on Friday, the 18th of October, 1889.

By order,
KEIGHLEY WALTON, Town Clerk.

The "MAIN" Patent GAS-FIRES.

WINTER SEASON, 1889-90.

By Her Majesty's Royal Letters Patent.

THE "VICTORIA" PATENT GAS-FIRE.

HANDSOME CLASSICAL DESIGN.

FORMS A BEAUTIFUL INTERIOR FOR TILED FIRE-PLACE.

STANDS IN FRONT OF ORDINARY GRATE OR FIRE-PLACE.

A COMPLETE GRATE BY ADDING IRON BACK PLATE.

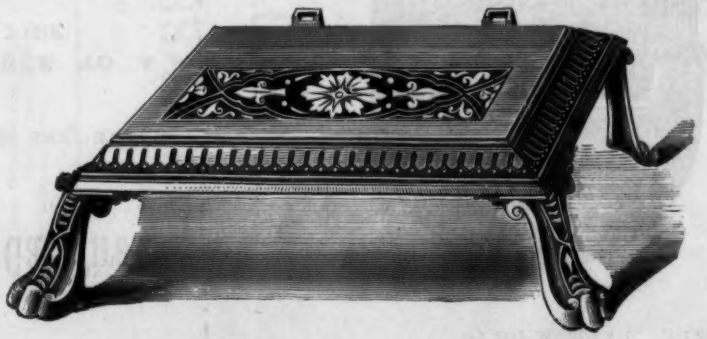
Has **HOT-AIR TUBES** for **WARM AIR SUPPLY,** in addition to **RADIANT HEAT,** securing great **ECONOMY OF GAS.**

Fitted with "Main's" Patent Iron Frets and Patent Permanent Fuel.

	Wide.	Deep.	High.	Consumption per Hour, 8-10ths Pressure.	Prices.
No. 1 - -	25 in.	10 in.	33 in.	20 ft.	£2 15 0
„ 2 - -	27 in.	11 in.	34½ in.	24 ft.	3 5 0
„ 3 - -	29 in.	12 in.	38 in.	28 ft.	3 15 0

ORDINARY PATTERNS "MAIN" PATENT FIRE,
From 10/6 upwards. *(See other side.)*

TILED STANDS FOR "MAIN" FIRES.



PRICES—No. 1, 7/6; No. 2, 9/-; No. 3, 10/6.

R. & A. MAIN, Argyle Works, Kinning Park, GLASGOW. LONDON OFFICE & SHOW-ROOM: 90, Hatton Garden, E.C.

Telegraphic Address: "GASMAIN, GLASGOW."

Advertisement Supplement to the Journal of Gas Lighting, *Oct. 8, 1889*

The "MAIN" Patent GAS-FIRES.

WINTER SEASON, 1889-90.

PRICES.

	Wide.	Deep.	High.	Consumption per Hour, 8-10ths Pressure.	Including Nickel-Plated Trivet.
No. 1 A -	11 in.	6 in.	16 in.	20 ft.	£1 1 0
„ 2 A -	13 in.	6½ in.	16½ in.	21 ft.	1 5 0
„ 3 A -	15½ in.	6½ in.	17½ in.	25 ft.	1 10 0
„ 4 A -	16½ in.	6½ in.	18 in.	27 ft.	1 15 0
„ 5 A -	20½ in.	7 in.	19½ in.	30 ft.	2 0 0

New Departure in Gas-Fires.

Artificial Appearance done away with.

EQUAL IN APPEARANCE TO A BRIGHT COAL FIRE.

MAIN'S PATENT

DOUBLE IRREGULAR IRON FRETS, with PATENT PERMANENT FUEL BETWEEN.

Greatly increased HEATING POWER, with Minimum Consumption of Gas.

New arrangement of Bunsen Burner, which can be turned very low without hissing sound or "firing back."

MOST ELEGANT DESIGN AND FINISH IN THE MARKET, AT LOWEST PRICES.

CAN BE FITTED IN ANY GRATE OR FIRE-PLACE.

Gas connection arranged for either side or back.

TIN KETTLES, specially adapted for above, Two Pints, 2/9; Three Pints, 3/6.

By Her Majesty's Royal Letters Patent.

PRICES.

	Wide.	Deep.	High.	Consumption per Hour, 8-10ths Pressure.	Including Nickel-Plated Trivet.
No. 1 B -	11 in.	4½ in.	13 in.	14 ft.	£0 10 6
„ 2 B -	12½ in.	5 in.	14½ in.	15 ft.	0 14 6
„ 3 B -	14 in.	5 in.	17 in.	20 ft.	0 18 0
„ 4 B -	15½ in.	5 in.	17½ in.	21 ft.	1 1 0

TILED STANDS, for both Patterns (See back), 7/6, 9/-, and 10/6.

R. & A. MAIN, Argyle Works, Kinning Park, GLASGOW. LONDON OFFICE & SHOW-ROOM: 90, Hatton Garden, E.C.

Telephone No. 1525. *Telegraphic Address: "GASMAIN, GLASGOW."*

London: Printed by Walter King (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 8, 1889.

Advertisement Supplement to the Journal of Gas Lighting, Oct. 8, 1889.

SPENT OXIDE.

THE Worksop Gas Company have about 45 tons of SPENT BOG ORE ready for delivery, which may be seen at the Works.

Tenders, at price per ton, to be sent to the Manager. Payment, cash on delivery.

NELSON LOCAL BOARD.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to accept TENDERS for the purchase of their surplus TAR produced at their Works during the Twelve months ending Oct. 31, 1890.

Probable quantity, about 500 tons.

Further information can be obtained from the Manager, Mr. W. Foster.

Tenders to be sent to the Chairman of the Gas Committee, Gas Office.

R. M. PRESCOTT,
Clerk to the Board.

Oct. 4, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2. CONTRACT No. 21.

BATTERY CONDENSERS.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply and erection of two BATTERY CONDENSERS at their Aylestone Road Works.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Condensers," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Oct. 12 inst.

The Committee do not bind themselves to accept the owest or any tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Oct. 1, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2. CONTRACT No. 22.

RETORT-FITTINGS, HYDRAULIC MAINS, ETC.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of RETORT-FITTINGS, HYDRAULIC MAINS, &c., at their Aylestone Road Works.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Retort-Fittings, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Oct. 12 inst.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Oct. 1, 1889.

SOCIEDAD CO-OPERATIVA GADITANA DE FABRICACION DE GAS.

THE above-named Society, requiring 3000 tons of COAL for Gas, of first quality, deliverable free in the Bay of Cadiz, during the months of December, January, and February next, solicit TENDERS from Proprietors of Mines or Merchants engaged in this Business, which should be addressed to the President of the Society, residing in Cadiz, Calle de Feduchi, No. 8, accompanied with full particulars.

Reference in London, Messrs. C. J. HAMBRO AND SON.

TENDERS FOR GAS COAL.

THE Directors of the Bradford-on-Avon (Wilts.) Gas and Coke Company, Limited, are prepared to receive TENDERS for the supply of 1000 tons of GAS COAL, delivered free at the Great Western Railway Station, or at the Canal Wharf, Bradford-on-Avon, in such quantities as required for the period of One year, commencing from Dec. 1 next.

Tenders, endorsed, and addressed to the undersigned, to be sent in not later than Saturday, Oct. 19.

The Directors do not bind themselves to accept the lowest or any tender.

No forms of tender provided.

By order,
H. A. SUMMERS, Secretary.

Gas Offices, Bradford-on-Avon, Wilts.

TO COAL MERCHANTS.

THE Milton Improvement Commission- ers invite TENDERS for the supply and delivery of about 600 tons of GAS COALS, to be supplied at such times and in such quantities during the year ending Oct. 23, 1890, as may be required.

The Coals must be delivered free of all charges over the ship's side at the Town Wharf, Milton.

Forms of tender and all necessary information can be obtained on application to the Gas Manager. Applications not on the Form supplied will be rejected.

The Commissioners do not bind themselves to accept the lowest or any tender.

Sealed tenders to be sent or delivered to me on or before Monday, the 21st of October inst., endorsed "Tender for Coals," and addressed to the Chairman of the Milton Improvement Commissioners.

WM. PARHAM, Clerk.

Milton-next-Sittingbourne, Oct. 3, 1889.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations, during a period of One, Two, or Three years, commencing on the 1st day of January, 1890.

The annual quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	525,000 gallons.
Canons' Marsh	470,000 "
Stapleton	430,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 4th day of November prox.

JAMES V. GREEN, Secretary.

Gaslight Offices, Canons' Marsh,
Sept. 20, 1889.

TO GASHOLDER BUILDERS.

THE Paisley Gas Corporation invite TENDERS for Making, Delivering, and Erecting at their Gas-Works, a TELESCOPE GASHOLDER, 160 feet diameter by 36 feet deep, together with Guide Columns and Girders complete.

Drawings may be inspected and specifications obtained on application to the Subscriber on payment of Five Guineas, but which will be returned on receipt of a proper tender.

Tenders to be lodged with Messrs. Young and Martin, Town Clerks, Paisley, on or before the 17th day of October current, endorsed, "Telescope Gasholder."

The Committee will not be bound to accept the lowest or any Tender.

GEO. R. HISLOP.
Engineer and Manager.

Gas-Works, Paisley, Oct. 3, 1889.

MOUNTAIN ASH LOCAL BOARD.

WATER-WORKS CONTRACT, No. 3.—CLYDACH AND BUARTH CAPEL RESERVOIRS.

TO CONTRACTORS.

IN order to give further Time to Con- tractors to make up their Tenders, the Mountain Ash Local Board Hereby Give Notice that the TENDERS for the STORAGE RESERVOIR in the Clydach Valley, the SERVICE RESERVOIR at Buarth Capel, and the COTTAGE at the Clydach Reservoir, WILL NOT BE OPENED by the Board until MONDAY, THE 28TH OF OCTOBER inst.

H. P. LINTON, Clerk.

Mountain Ash, Oct. 5, 1889,

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,

RETORT SETTERS & CONTRACTORS,

Having had much experience in the Setting of Retorts beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.

Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.

Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

Now Ready, price 15*s.*, *limp cloth, the Ninth Yearly*

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES,

CHELSEA, EAST LONDON, GRAND JUNCTION, KENT,
LAMBETH, NEW RIVER, SOUTHWARK & VAUXHALL, AND WEST MIDDLESEX.

SHOWING THE

CAPITAL, INCOME, EXPENDITURE, PROFITS, and DIVIDENDS, per MILLION and per THOUSAND GALLONS of WATER SUPPLIED; the PROPORTION of EXPENDITURE and PROFITS to GROSS INCOME; and the INCOME, EXPENDITURE, and PROFITS per HOUSE, &c., supplied.

FOR THE YEAR ENDED { DEC. 31, 1888. / MARCH 31, 1889.

TOGETHER WITH

THE QUANTITY OF WATER SUPPLIED,
THE ESTIMATED DAILY QUANTITY SUPPLIED FOR DOMESTIC AND OTHER PURPOSES,
THE QUANTITY SUPPLIED PER HEAD OF POPULATION, &c., &c.,

FOR THE YEAR ENDED DECEMBER 31, 1888.

Compiled and arranged by ALFRED LASS, Fellow of the Institute of Chartered Accountants.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

THE ONLY RELIABLE

DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

MARQUIS OF LOTHIAN'S

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

MR. JOHN MORISON,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

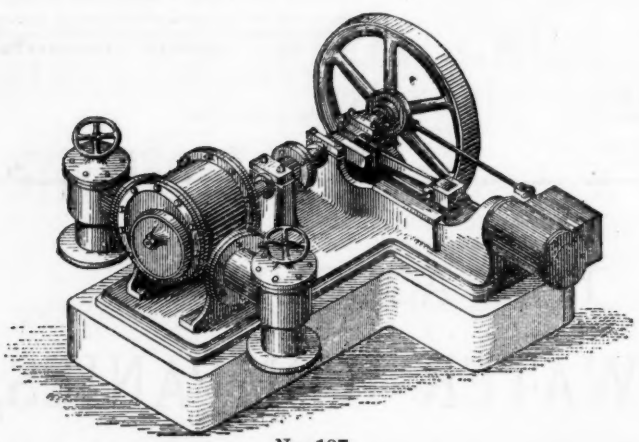
G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.

MADE WITH 4, 3, OR 2 BLADES.

In use at, or on order for, over 120 *Works, equal to* 6,840,000 *Cubic Feet per Hour.*

Oldest Makers of Beale Exhausters for over 300 Works and 25,600,000 cubic feet per hour.

1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.



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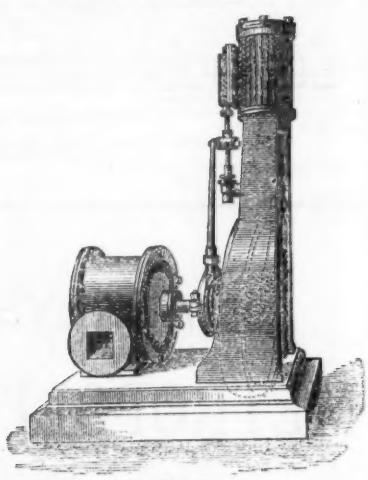

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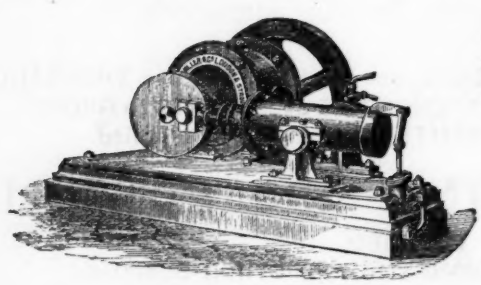

No. 5.

No. 137.—Horizontal Combined Engine and Exhauster.
No. 6.—Vertical ,, for small space.
No. 5.—Oscillating ,, for small works.

BYE-PASS VALVES.

Disc, Rack, and Screw Valves, Compensating Governors (For Steam Throttle Valves),

Tar, Liquor, and Water Pumps, Hydraulic Main Valves, Coke-Breaking Machines.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,

NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT

STROUD, GLOUCESTERSHIRE.

THE

GOLD MEDAL

(Highest Award, Class 27, British Section)

AT THE

PARIS EXHIBITION

Has been awarded to

WILLIAM SUGG & Co., LIMITED,

VINCENT WORKS,

WESTMINSTER, S.W.,

FOR

SUGG'S PATENT

HIGH-POWER, FLAT-FLAME, and other LAMPS;

"LONDON" ARGANDS, "CHRISTIANIA," and other FLAT-FLAME BURNERS;

GOVERNORS, DOUBLE & SINGLE, for DOMESTIC and PUBLIC LIGHTING;

"CROMARTIE" (INVERTED FLAME) LAMPS, VENTILATING and otherwise;

SUN-BURNERS & APPARATUS for VENTILATING by GAS;

WROUGHT-IRON LAMPS and BRACKETS;

READING LAMPS — "ALADDIN," ARGAND, and "CHRISTIANIA;"

THERMA WATER-HEATING APPARATUS.

1 & 2, Grand Hotel Buildings, Charing Cross, W.C.

33, Bold Street, Liverpool; 409, Keizersgracht, Amsterdam

GEORGE McKAIG,
MANUFACTURER OF **WOOD GRIDS**
FOR GAS PURIFIERS,
36, Cleveland Street, DONCASTER.

GEO. E. TOURNAY,
Retort-Setter,
Contractor for the Erection of Retort-Ovens, Chimney Shafts, &c.,
THANNINGTON, CANTERBURY.

THOMAS ILLINGWORTH,
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Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

"TEST PAPERS"
FOR GAS, ETC., PREPARED BY
R. D. GIBBS, Summerfield Crescent, Birmingham.

VALUATION OF COAL
FOR GAS MAKING, ETC.
Estimation of (1) Moisture, 1s.; (2) Volatile Matter, 1s.; (3) Coke, 1s.; (4) Permanent Gases, 2s. 6d.; (5) Ash, 1s.; (6) Ammonia Capacity, 2s.; (7) Carbon, 1s. 6d.; (8) Sulphur, 2s. 6d. 1, 2, and 3 = 2s. 6d.; 1, 3, and 4 = 4s. Complete Combustion, 10s. 6d.
Five Samples submitted at same time to secure above Rate.
Estimation of Ammoniacal Liquor, 2s. 6d.; Oxide, for Active Iron, 2s.; for Sulphur, 3s.
R. D. GIBBS, Ph. Ch., Summerfield Crescent, Birmingham.

COZE'S
AUTOMATIC SYSTEM
OF
Charging and Drawing Retorts.

THIS System of automatically Charging and Discharging Retorts without machinery or arduous labour, which is in operation at several places, will shortly be at work in England.
All information as to the advantages, cost, &c., of the System, can be obtained from the undersigned, who will arrange to grant the user for a small Payment per Retort, or a slight Royalty. The System is fully patented; and any infringer will be strictly proceeded against.
An Agent will shortly be appointed in England.

A. COZE,
MANAGER, RHEIMS GAS COMPANY, FRANCE.

GAS AND WATER PIPES.
1½ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
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ALSO MANUFACTURERS OF
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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.
Prices are Reduced.

Newland Gas Coal
For particulars, apply to
LOCKE & CO.,
NORMANTON,
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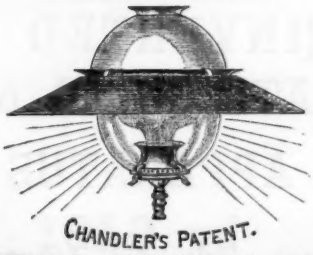
CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

THE
"SILVER" LIGHT.



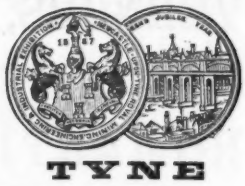
CHANDLER'S PATENT.
SUITABLE FOR EVERY FORM OF LIGHTING.
A beautiful white light from ordinary Gas. Silent, steady, and economical.
PACKED IN BOX 9s., SUBJECT.
S. CHANDLER & SONS,
Central Works, Kennington Oval, S.E.

JAMES NEWTON & SONS,
(Established 1820)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

FIRE-BRICKS. FIRE-CLAY.
JAMES WHITE & CO.,
Albert Oil-Works,
WIDNES, LANCASHIRE.
Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.
FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.
GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.
ANALYSIS AND REFERENCES ON APPLICATION.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.



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BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles,
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

WARNER'S RETORT-HOUSE MACHINERY.
[*As Illustrated and Described in the* JOURNAL *for May* 4, 1880.]
Communications to be addressed to
W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

Sept. 28, 1889.

Paris Exhibition.

THE

ONLY GOLD MEDAL

(Highest Award)

For Gas Heating Appliances

Has been obtained by the Exhibit of

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London Office and Show-Rooms: 77, QUEEN VICTORIA STREET, E.C.

BRECKENRIDGE CANNEL,

OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,

ON THE CONTINENT,

OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

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PERKINS & Co., SOLE AGENTS,

Cable Address: "Perkins New York." 228, PRODUCE EXCHANGE, NEW YORK.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

A PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

Room 446—11, QUEEN VICTORIA STREET, LONDON, E.C.,

Where Price Lists and full particulars may be obtained.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795). **WORTLEY FIRE-BRICK WORKS,**

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

London Wharf: No. 4, Inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

THE GAS APPARATUS Co., PETERBOROUGH,

GAS ENGINEERS,

Manufacturers, Gas-Works Furnishers,

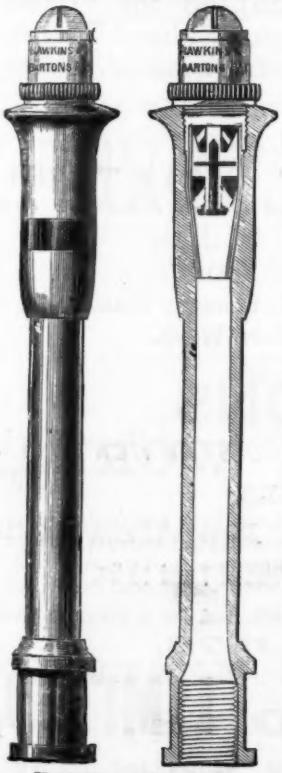
AND MAKERS OF ALL KINDS OF

Gas Burners, Governors, Lamps, Gauges,

AND SPECIALTIES OF EVERY DESCRIPTION.

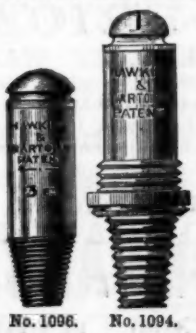
ALSO SOLE MANUFACTURERS OF

Hawkins & Barton's Patent Self-Regulating Lamp Governors and Burners.



Full Size, No. 1098.

These Governors are made to take to pieces for cleaning and re-adjusting.



No. 1096. No. 1094.

An enormous quantity of these Burners are in use in this Country and abroad; and they have never failed to give satisfaction. Wherever they are adopted, complaints against Bad Gas and Excessive Gas Bills naturally cease. Owing to their extreme simplicity, they cost less than half that of any others, and will last years without attention.

Trial Orders Solicited.

PRICES AND TERMS ON APPLICATION.

Works & Offices: PETERBOROUGH.

REPORTS

By T. NEWBIGGING, Esq., C.E
Feb. 25, 1889.

Burner tested, 4 feet.
Pressure, 10, 15, 20, 25 tenths.
Consumption, 4, 4, 3·25, 3·8 feet.

By G. BOWER, Esq., C.E.,
St. Neots, *March* 12, 1889.

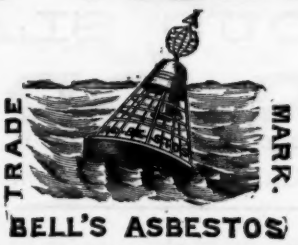
"I have tested your Pressure Regulating Burners; and I find that those you sent me do not vary more than two-tenths under pressures varying from six to forty tenths. I shall not only use them myself, but I shall recommend others to use them."

By J. MACKAY, Esq., Engineer,
Gas-Works, Peterhead,
July 13, 1889.

"The enclosed Burner has been in use here all last winter, and does not seem much the worse. We had seven different kinds of Governors on trial, and yours seemed to come out the best. Please send us five gross more of the same kind."

Awarded FIRST PRIZE MEDAL at the Falmouth Royal Polytechnic Exhibition, 1889.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

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Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

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PATENT No. 15,498.

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SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

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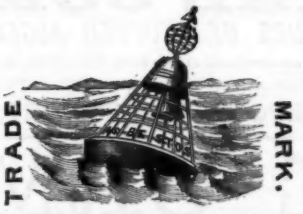

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Is the BEST LOCOMOTIVE PACKING made.

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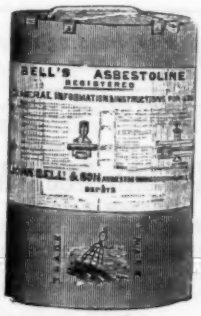
Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.

BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.



ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

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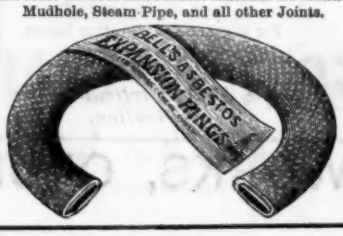
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



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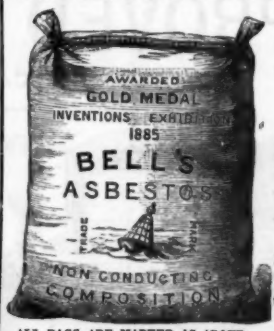


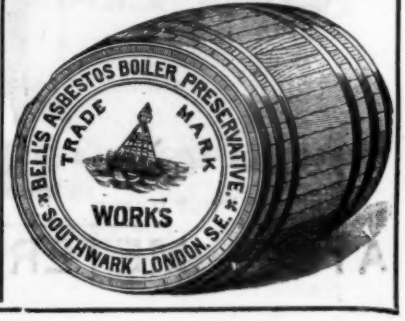
ALL BAGS ARE MARKED AS ABOVE.

Will reduce loss by radiation, and saves 40 per cent. of fuel.

Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

Is sent out dry in bags; therefore cheaper than others sent out wet.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



WASHER-SCRUBBER AND SLOW-SPEED CONDENSER

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These Apparatus are in use at the Gas-Works at Lincoln, Mountain Ash, Neath, Ellesmere (Salop), and Woodstock (Capetown); and
Two large CONDENSERS capable of dealing with **4,000,000** cubic feet of Gas per day are in course of Manufacture for the Gas-Works at Sheffield.

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AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

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A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

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MANUFACTURERS OF

IMPROVED WET & DRY METERS

IN CAST-IRON AND TIN-PLATE CASES.

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Meters Supplied with Harding's Counter and Grey's Index.

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MORE THAN 150,000 IN USE.

ADOPTED BY THE LEADING LONDON AND PROVINCIAL GAS COMPANIES.

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FOR DOMESTIC USE.

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TO WORK ON THE DOWN PIPE,

For Regenerative and other Lamps.

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PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

(Patented the 4th of May, 1889.)

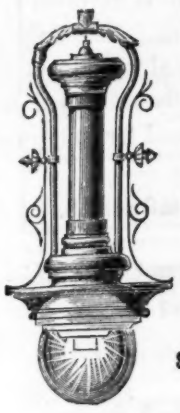
This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in Opal, clear or coloured Glass; and is much cheaper than the old style of metal frames.

Prices on application.

PILKINGTON BROS.,

Glass Works, St. Helens, Lancashire.

"THE METEOR."



NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

PARTICULARS & PRICES POST FREE.

HENRY GREENE & SONS,
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GAS and WATER ENGINEERS,

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PUBLIC LAMPS & LANTERNS:

GLASS—Flint, Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

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Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

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PROPRIETORS AND MANUFACTURERS OF

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PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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IN

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NO WASTE

BY USING THE

"DIAMOND"

WASTE OIL FILTER.

Pays for itself in a very short time.

Prices and Particulars on Application to

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W. PARKINSON & CO.'S
PRESSURE RAISERS

Have been supplied for many years, and are now in successful operation, for the purpose of

INCREASING THE PRESSURE IN LOW DISTRICTS, ETC.

The Machine acts as an Exhauster, drawing the Gas from the Main and propelling it according to the Pressure required. The result is obtained by a Wet-Meter Drum, which is revolved by Multiplying Wheels and Pullies, actuated by a Weight, as shown in the Engraving. The Pullies may be so arranged as to keep the Apparatus at Work for many hours, provided only there is sufficient depth for the Weight to fall. Pressure Raisers have been successfully employed in connection with Apparatus for the Manufacture of Oil Gas, &c. They are also used for supplying a current of Air for various purposes.

TESTIMONIALS.

From Peter W. Barlow, Esq., F.R.S., F.G.S.
Engineer to the Tower Subway Co.

56, *Landsdowne Road*, W.,
Feb. 21, 1888.

Dear Sirs,

The Gas-Pressure Engine in the Tower Subway acts most satisfactorily. It requires very little attention, and is very rarely out of order.

I am, yours truly,
Peter W. Barlow.

Cork Gas Comsumers' Company,
Gas-Works, Cork,
20*th Feb.*, 1888.

Gentlemen,

In reply to yours, I beg to say that the Motive-Power Meters with which you have supplied this Company are doing very well. With them we are able to give a good supply to consumers in districts where it would be otherwise difficult to do so.

I am, faithfully yours,
Thomas Travers,
Engineer.

COTTAGE LANE WORKS, CITY ROAD, LONDON, E.C.

Telegraphic Address: "INDEX, LONDON."

[See also Advt., p. 632.

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